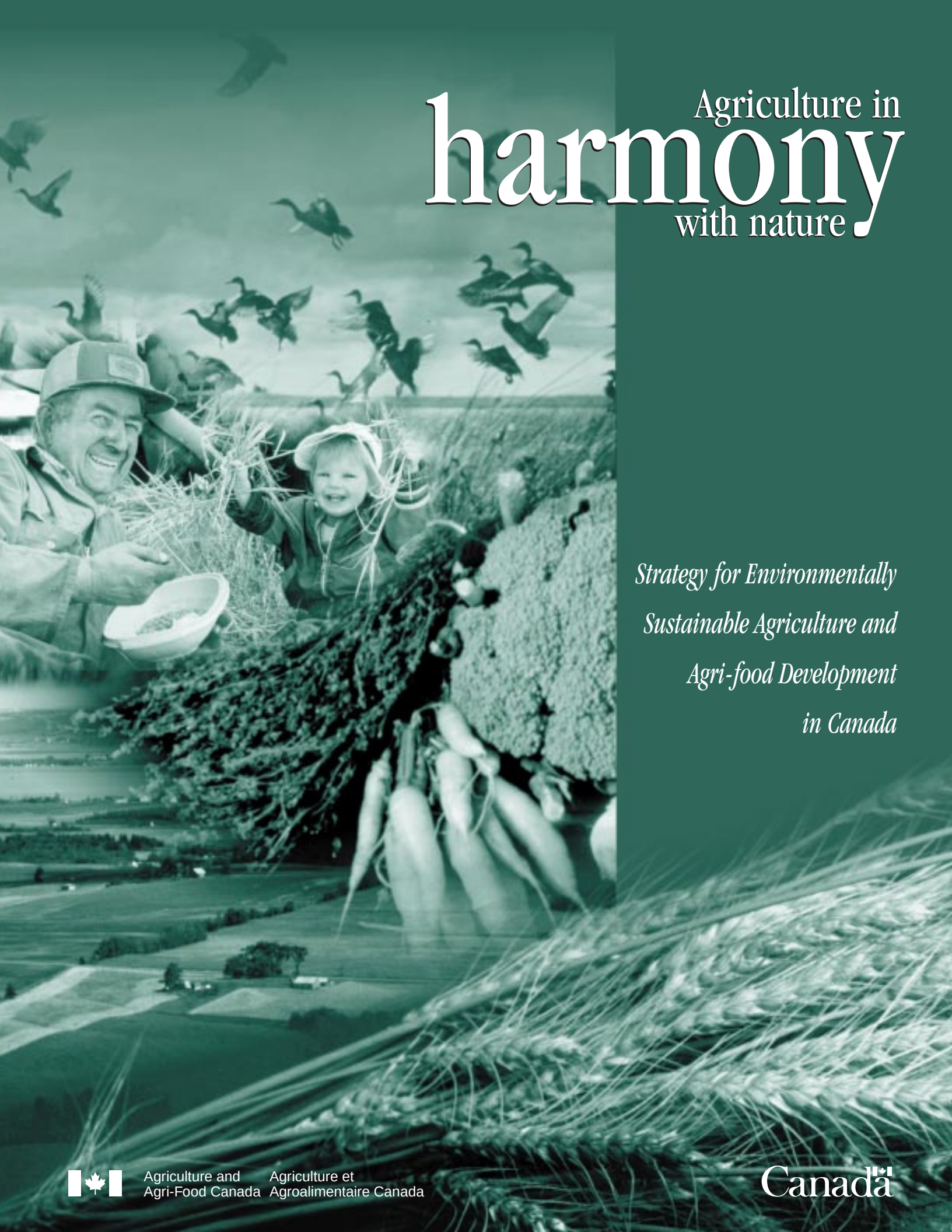
Agriculture in harmony with nature



Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Canada

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From the Minister of Agriculture and Agri-Food Canada

Hon. Ralph Goodale

Sustainability in the agriculture and agri-food sector means a thriving industry, a safe and high-quality supply of agricultural products, new market opportunities both at home and throughout the world, and a fair sharing of the benefits among all people. Essential to all of this is a healthy environment — unspoiled lakes and rivers, healthy and productive soils, and good clean air.

To get there, we need a strategy that encourages us to integrate environmental thinking into every decision made in Canada's agriculture and agri-food sector. But we're not starting cold on this. Farmers and others in our sector already have years of successful experience in voluntary activities to protect the environment. *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada* is designed to build on what's already being done, to provide a framework for better partnerships between government and industry, and wiser stewardship of scarce dollars.

The strategy takes into account the changing world in which we live, including the new environmental challenges the sector faces, such as conserving water quality and limiting environmental effects off the farm. As Canadians, we must also cooperate with other countries in the international community to meet environmental commitments and ensure our planet can sustain an adequate and accessible food supply into the future. Canadian expertise and technology in sustainable agriculture can become an important export opportunity for our country.

A good strategy is aimed at "doing", not just "planning". We need to hold each other accountable for getting the job done — for moving step-by-step closer to the reality of sustainable agriculture and agri-food production. We're building a secure future for our children and grandchildren. Let's work together for growth in the sector and respect for the natural world around us.

Ralph Goodale

Table of Contents

Executive Summary

Introduction

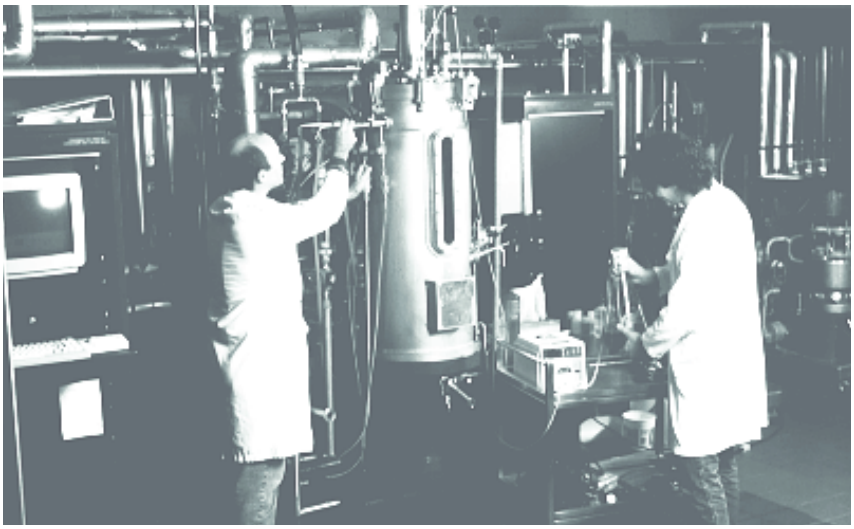
Canada is committed to sustainable development, bringing together our economic, social, and environmental goals and ensuring that Canadians' needs are met today and in the future while we live in balance with other components of the earth's ecosystems. Achieving environmentally sustainable agriculture is a process of continuous improvement, energized and carried out by members of the agriculture and agri-food sector and supported by government. The benefits will be great — protection of the natural resource base, added economic competitiveness of the agriculture industry, and a safeguard of the livelihood and well-being of agricultural workers and their families.

In its new environmental agenda, *A Guide to Green Government*, the federal government calls upon its departments to devise sustainable development strategies, to be tabled in Parliament by December 1997 and subsequently audited by Canada's newly appointed Commissioner of the Environment and Sustainable Development. This report, *Agriculture in Harmony with Nature*, presents Agriculture and Agri-Food Canada's *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada*, developed in consultation with many sectoral and interest groups. The strategy focuses on environmental sustainability, aiming to bring understanding of this component of sustainable agriculture and agri-food production up to the level of our understanding of social and economic components. A companion document, *Profile of Production Trends and Environmental Issues in Canada's Agriculture and Agri-food Sector*, provides a more thorough assessment of the economics and production of the sector, and a detailed profile of pertinent environmental issues.

This strategy is intended to provide decision makers in the sector and the department with useful tools and information to help make the Canadian agriculture and agri-food sector's environmental performance a factor that enhances its growth prospects rather than limits them. It is designed to provide these decision makers with the means to integrate environmental considerations into their day-to-day management on a proactive rather than reactive basis. The success of this strategy will depend on the strength of partnerships with the agriculture and agri-food industries, other orders of government, the environment community, and other Canadians.

Agriculture and Agri-Food Canada's Environmental Commitment

Agriculture and Agri-Food Canada works with the agriculture and agri-food industries and other Canadians to conserve the resource base on which food production depends and to protect the environmental integrity of the agricultural landscape for present and future generations while maintaining the highest environmental standards in the operation of our own department.



The following six principles guided the design of *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada.*

Partnerships: We will actively cooperate with our sectoral, government, and other partners in our work to promote sustainable agriculture and agri-food production.

Integration: We will encourage building environmental thinking into the way decisions are made and business is conducted in Canada — on the farm, in the food processing plant or food distribution centre, and in the government office.

Ecosystem approach: We will promote an ecosystem approach to better place agriculture and agri-food activities in the context of the broader environment.

Environmental and resource stewardship: We will promote "anticipate-and-prevent" rather than "react-and-cure" approaches to the stewardship and protection of the resource base and the environment.

Intergenerational equity: We will strive for a fair distribution of the costs and benefits between generations and encourage environmentally responsible practices today to minimize the environmental liabilities our children might some day have to assume.

Competitiveness: We will build on and support a market system that promotes the best environmental practices, clarifying the linkages between environmental sustainability and economic productivity and competitiveness.

Issue Scan: Production Trends and Environmental Issues

The agriculture and agri-food sector accounts for 9% of the GDP. Directly or indirectly, it provides jobs for about two million people — nearly 15% of the nation's employment. The sector generates more than $17 billion in exports and contributes almost $5 billion to Canada's positive trade balance.

Farm production is affected by physical, technological, economic, and social factors. The nature of these factors varies tremendously across Canada, and many diverse agricultural production systems have evolved. The environmental risks of agricultural production also vary significantly as a function of the type of production, the environment in which production takes place, and management practices. Environmental issues related to agriculture and agri-food production include water quality and use; use and management of agricultural inputs (nutrients, pesticides, and energy); land use, land management, and soil quality; agroecosystem biodiversity; climate; and air quality.

As the farm sector continues to broaden its environmental approach from farm resource conservation to the effects of its operations on the larger ecosystem, new issues are emerging, largely driven by concern for human health and off-farm environmental effects. Water quality, now the public's greatest concern related to natural

resources, is affected by management of soils, manure, fertilizers, pesticides, and other chemicals. Other emerging issues are environmental liability, compliance with provincial requirements for agricultural practices, and international scrutiny of the potential risks associated with agricultural inputs, such as pesticides.

The environmental future of Canadian agriculture and agri-food will continue to be shaped by social and economic forces, including the world's demand for food; commodity prices; federal, provincial, and municipal government policies; international trade agreements; technology; and agricultural research. The food- and beverage-processing industry is working to enhance its competitiveness, productivity, and export performance. It will be important to ensure that economic progress is accompanied by environmental gains. Also needed is better information on environmental opportunities and risks in the industry. Primary production agriculture will need to increase production on existing cropland to meet the growing world demand for food and non-food products. This will likely mean continued intensification and concentration of production in both crop and livestock commodity sectors, and potentially increased environmental risks. To minimize these risks, agri-food decision makers at all levels will require access to appropriate tools and information.

Strategic Approach

Agriculture and Agri-Food Canada's *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada* recognizes the interest of Canada's agriculture and agri-food sector in promoting sustainable development and builds on its previous successes in adopting environmentally sustainable practices. This strategy follows four strategic directions.

Strategic Direction 1: Increasing Understanding

Improve the capacity of departmental and sectoral decision makers to integrate environmental factors into day-to-day decision making.

Achieving sustainable agriculture and agri-food production is a process of continuous change and improvement that depends on a good understanding of how economic, social, and environmental issues are linked to the sector's activities. Agriculture and Agri-Food Canada will promote a better understanding of these interactions, as well as more balanced decision making, by providing good information. We will improve our ability to gather, analyse, interpret, summarize, and distribute such information, as well as integrate environmental thinking into our policies and programs.

Priorities:

- *Focus and enhance the department's analytical capabilities and provide timely and appropriate information to encourage greater integration of environmental factors into sectoral and departmental decision making.*
- *Integrate environmental sustainability objectives into departmental policies, legislation, and programs.*

Strategic Direction 2: Promoting Environmental and Resource Stewardship

Promote the stewardship and sustainable use of the environment and agricultural resource base by the agriculture and agri-food sector.

The sector's long-term success depends on its ability to carry out its business based on a broad stewardship ethic that recognizes the sector's place in Canada's ecosystems. Improving the sector's environmental performance involves conserving resources

and addressing off-site effects on the environment, particularly by preventing environmental damage. Agriculture and Agri-Food Canada will practise good stewardship and environmental protection in its own operations and will carry out activities to help the sector in its efforts to do the same.

Priorities:

- *Develop mechanisms to encourage adoption within the agriculture and agri-food sector of practices that enhance multiple-use benefits and stewardship of natural resources.*
- *Integrate environmentally responsible approaches into the management of the physical operations of the department.*

Strategic Direction 3: Developing Innovations and Solutions

Focus research, development, and technology transfer to address environmental challenges and foster sustainability in the agriculture and agri-food sector.

Innovative products and technologies are the tools needed by the sector to make sustainable development a reality. Agriculture and Agri-Food Canada will work with the sector to identify and provide many of these tools by conducting research to reduce on- and off-farm environmental effects of farming activities and provide alternatives to unsustainable farming and food production methods. We will also help to identify areas and issues that most need attention.

Priorities:

- *Through research and development, increase the availability to industry of commercially viable systems and technologies to address on- and off-farm environmental effects of agricultural activities.*
- *Identify areas at most environmental risk.*

Strategic Direction 4: Seizing Market Opportunities

Encourage agriculture and agri-food marketing and trade that promote environmental quality and sustainable growth.

Remaining competitive in a demanding market place while respecting the environment calls for continuous improvement in the way the sector and the department do business. Agriculture and Agri-Food Canada will undertake market intelligence and negotiation and implementation of trade agreements to help the sector address environmental challenges related to trade and take advantage of environmental marketing opportunities.

Priorities:

- *Increase industry awareness of environmental marketing and trade opportunities and constraints, enabling proactive responses.*
- *Facilitate the demonstration of the environmental quality of products, practices, and services provided by the agriculture and agri-food sector.*
- *Influence domestic and international initiatives in the interests of environmental progress and the Canadian agriculture and agri-food sector.*

Actions supporting these priorities are found in the text of this strategy.

Introduction

Sustainable Development

Sustainable development is a way of bringing together Canada's economic, social, and environmental goals. And it's a way for Canadians to meet their needs while living in balance with other components of the earth's ecosystems and ensuring a healthy and secure future for generations to come. It is this prosperous future that the federal government is aiming for by promoting sustainable development in Canada.

Sustainable Agriculture and Agri-food Production

Sustainable development in agriculture and the agri-food industries is a way of producing, processing, and distributing food products that can be carried on for generations, supporting the high quality of life we enjoy in Canada and contributing to a robust economy. When carried out in a sustainable manner, agriculture and agri-food production can be expected to:

- protect the natural resource base and prevent the degradation of soil, water, and air quality;
- contribute to the economic and social well-being of Canadians;
- ensure a safe and high-quality supply of agricultural products;
- safeguard the livelihood and well-being of agricultural workers and their families.

Sustainable Development Strategies

Achieving sustainable development in Canada is a process of continuous improvement as we work toward the integration of economic, social, and environmental concerns. The federal government has presented a new environmental agenda, *A Guide to Green Government*, that calls upon its departments to devise sustainable development strategies.

Accompanying this new agenda is an amendment to Canada's *Auditor General Act* that creates a new position, Commissioner of the Environment and Sustainable Development. The sustainable development strategies prepared by each federal department will be tabled in Parliament no later than December 1997, and the Commissioner will report on each department's success in implementing its strategy.

This report, *Agriculture in Harmony with Nature*, presents Agriculture and Agri-Food Canada's *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada*, developed in consultation with many sectoral and interest groups. The strategy will evolve over time, always reaching for a balance among economic, social, and environmental concerns.

A companion document, *Profile of Production Trends and Environmental Issues in Canada's Agriculture and Agri-food Sector* provides a more thorough assessment of the economics and production of the sector, examining the primary production of plant and animal commodities, the food- and beverage-processing industry, and changes in agricultural land use in Canada. It also gives a detailed profile of the environmental issues pertinent to the sector, examining issues such as the quality and use of water, agricultural inputs, and land.

Focussing on the Environment

Agriculture and Agri-Food Canada has already done much work to define its economic and social goals, understand their implications for society, and design steps to make social and economic progress in agriculture and agri-food production in Canada. The department's business plan describes those goals. We have more work to do to make the same contribution on environmental aspects of sustainable development.

"The Government of Canada believes that sustainable development is not only a desirable but an essential goal of public policy. Achieving sustainable development requires an approach to public policy that is comprehensive, integrated, open, and accountable. It should also embody a commitment to continuous improvement."

A Guide to Green Government, 1995

For this reason, the strategy presented here emphasizes environmental sustainability with the goal of better integrating this concept into existing ways of doing business. It builds on the business plan by describing more fully the environmental challenges and opportunities the department is best placed to address and the manner in which it will work with the sector to make further environmental progress. Once this strategy is implemented, the department will take further steps toward more fully integrating economic, environmental, and social aspects in future strategies for sustainable development.

A History of Partnerships

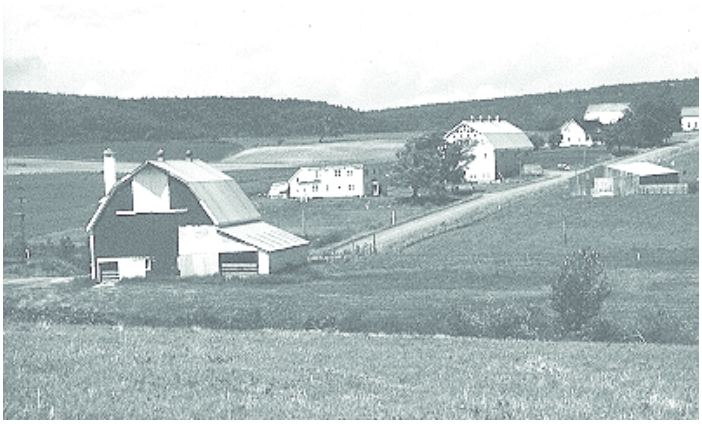
Agriculture and Agri-Food Canada has a long history of working with the sector and other partners to improve stewardship skills. More than 100 years have passed since our first experimental farms were established to assist farmers in making the most of their farm resources. During this time many federal initiatives have served to protect agricultural resources, from the inception of the Prairie Farm Rehabilitation Administration during the dust bowl years of the 1930s to more recent environmental efforts, such as the National Soil Conservation Program and the Green Plan Sustainable Agriculture Initiative.

As agriculture and agri-food industries have changed over the years, so have their effects on the environment. Canadian farmers, food processors, and food distributors are taking this situation seriously. Environmental stewardship has never been better understood or considered more important by those intent on sustaining a productive business. This is in some measure the result of continuing efforts to promote a conservation ethic and to develop new systems and technologies that will make sustainable development a reality. These successes are the product of cooperative efforts with provincial ministries, sectoral organizations, and other groups.

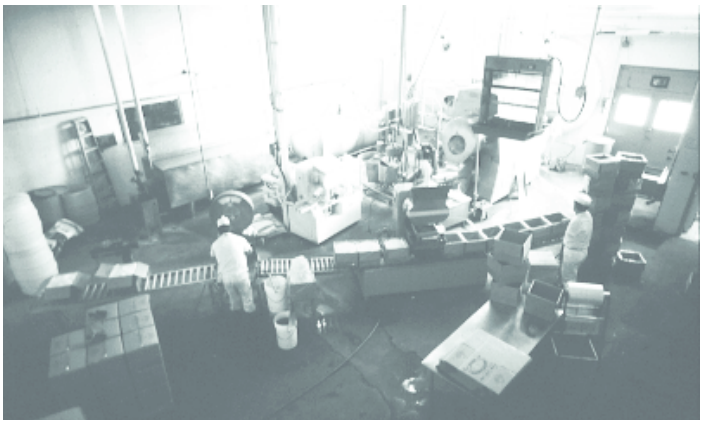
Beyond Farm Boundaries and Plant Walls

After many years of managing wastes, Canada's agri-food industry is well aware of its potential impact on the environment outside plant walls. The same awareness has grown in agriculture as farmers see their

Sustainable development ...



On the farm ...



and in the plant.

land as part of the larger ecological system and understand how their management decisions on the farm can have significant environmental effects off the farm.

All Canadians have an interest in the stewardship practised in the agriculture and agri-food sector. Good stewardship in the processing plant encourages pollution prevention and efficient use of resources. And good stewardship of our farm lands not only safeguards the quality and availability of our food, but also helps this land to play its proper ecological role in the larger system. With the help of partners in government, the scientific community, and the larger community, sectoral workers are broadening their stewardship ethic and making it part of their everyday business.

Order in Our Own House

Agriculture and Agri-Food Canada employs thousands of people across Canada, manages many facilities and land holdings, makes sizeable purchases of goods and services each year, and runs a large fleet of motor vehicles. How we manage these assets can make a considerable contribution to the government's role in sustainable development.

This first sustainable development strategy focuses on our efforts to work with the sector to achieve environmental sustainability. It also commits us to developing and implementing an environmental management system and action plan for the greening of the department's physical operations over the next three years.

Moving Forward

The sector has promising prospects for growth, with talents, energy, and a reputation for quality and safety that place it in a strong position to compete effectively in both Canadian and international markets. This strategy describes the way Agriculture and Agri-Food Canada will work with the sector and other partners to reinforce that position and ensure that environmental performance continues to contribute to sustained growth.

More Information

In keeping with the requirements for reporting the strategy, a departmental profile is presented (Appendix 1), as are descriptions of performance measures (Appendix 2) and the consultations carried out in preparing the strategy (Appendix 3).

Environmental Commitment of Agriculture and Agri-Food Canada

"Change in agriculture and agri-food is also being driven by environmental imperatives, to preserve our soil and water resources, to preserve our environment and to deal with global warming."

Hon. Ralph Goodale, Agriculture Forum on Climate Change, January 1996

Our Commitment to Environmental Sustainability

Agriculture and Agri-Food Canada promotes the development, adaptation, and competitiveness of the agriculture and agri-food sector. Through national policies, programs, and services, we help the sector maximize its contribution to Canada's economic and environmental objectives and ensure a dependable supply of safe, nutritious food at reasonable prices to consumers, with equitable returns to producers and processors.

We believe it is our responsibility to work with the agriculture and agri-food industries and other Canadians to conserve the resource base on which food production depends. It is also important to protect the environmental integrity of the agricultural landscape for present and future generations while maintaining the highest environmental standards in the operation of our own department. We have been working for some time already to fulfil these responsibilities, as outlined in our departmental profile (Appendix 1).

Guiding Principles

The following principles helped to guide the design of this strategy.

Partnerships

We will actively cooperate with our sectoral, government, and other partners in our work to promote sustainable agriculture and agri-food production.

Working toward environmental sustainability requires mechanisms that ensure ongoing communication, consultation, and collaboration among governments, farm groups, food businesses, consumers, universities, volunteer agencies, and environmental organizations. The history of Agriculture and Agri-Food Canada reflects collaboration based on the strengths and jurisdictional responsibilities of each participant. Under our commitment to sustainable development, we will refine these historic partnerships, taking into account those activities in which we can play a leadership role.

Integration

We will encourage building environmental thinking into the way decisions are made and business is conducted in Canada — on the farm, in the food processing plant or food distribution centre, and in the government office.

The balance among environmental, social, and economic factors is fundamental to sustainable development. Less attention has been given to environmental issues in previous federal policies, but these factors are inextricably linked. By building environmental thinking into our decisions, farmers, processors, and all others in the sector will be assured of a livelihood that respects the ecosystems in which we live. As well, government efforts will be directed more effectively to promoting sustainable development in Canada.

Ecosystem Approach

We will promote an ecosystem approach to better place agriculture and agri-food activities in the context of the broader environment.

An ecosystem is a complex of living organisms, including humans, and their physical surroundings, interacting in intricate ways. Farms, food processing plants, and food

distribution operations in Canada are all situated within ecosystems, and their activities can affect the health of those systems. The environmental impact of Canada's agriculture and agri-food industries must be understood in this broader context. We need to improve our ability to provide the sector with more complete information concerning the environmental effects of agricultural activities both on and off the farm.

Environmental and Resource Stewardship

We will promote "anticipate-and-prevent" rather than "react-and-cure" approaches to the stewardship and protection of the resource base and the environment.

It is both good resource management and good business practice to introduce sound environmental planning and design as the normal approach to farm and plant management, thus avoiding the need for costly environmental clean-ups. This strategy is based on an approach to environmental protection that incorporates environmental considerations as a forethought, not an afterthought, in business decisions and makes use of good planning tools and sound management practices.

Intergenerational Equity

We will strive for a fair distribution of the costs and benefits between generations and encourage environmentally responsible practices today to minimize the environmental liabilities our children might some day have to assume.

Farmers are known for the "family farm" tradition and today want to ensure that their children do not inherit pollution problems and costly clean-ups when taking over the farm. Agri-food industries too have a responsibility to use good business sense and environmentally sustainable methods so that undue burden is not passed on to the next generation. Agriculture and Agri-Food Canada wants to show the same farsightedness in designing and implementing policies and programs with a sound understanding of the legacy they will leave our children.

Competitiveness

We will build on and support a market system that promotes the best environmental practices, clarifying the linkages between environmental sustainability and economic productivity and competitiveness.

Environmental progress is achieved fastest in industry if the solutions to environmental challenges make economic sense. Business decisions that don't generate immediate returns must improve the operation's competitive position over the medium or long term. Our efforts to provide information, design innovations, introduce policies, or pass regulations will prove most effective if they are sensitive to the competitive environment in which the sector operates.

Environmental Context

For most of this century, environmental efforts by governments and producers have been directed at securing the health and productivity of the land resource base. Soil conditions of the 1930s spurred a number

of land conservation efforts on the Prairies as well as several research initiatives, such as the Soil Survey of Canada.

Concerns about the degradation of agricultural land resources were again raised and popularized by the 1984 report *Soil at Risk: Canada's Eroding Future* of the Senate Standing Committee on Agriculture, Fisheries, and Forestry. Governments responded with a suite of national and regional programs, such as the National Soil Conservation Program, the Land Management Assistance Program, and the Permanent Cover Program. As a result, producers adopted a number of soil-conserving practices and technologies.

In 1989, the federal government conducted the comprehensive Agri-Food Policy Review, subsequently devising a framework for integrating the economic, social, and environmental goals of the sector. In their 1990 report, the Federal–Provincial Agriculture Committee on Environmental Sustainability translated the concept of integration into more concrete terms, broadening the environmental agenda beyond the traditional focus on soil conservation to include issues such as water quality, water quantity, genetic resources, energy efficiency, air and climate, and pollution and waste management. The Green Plan Sustainable Agriculture Initiative reflected this broader focus.

The National Environment Strategy for Agriculture and Agri-Food, presented in 1995, further broadened the environmental agenda by including new issues associated with international agreements, marketing, processing, liability, and public perception. In consultations to develop this strategy, stakeholders emphasized issue resolution led by the sector, with a firm desire for continued partnership with government.

Outlook for the Future

Agriculture and agri-food industries are undergoing continuous change as they respond to modern pressures. These pressures include expectations for progress toward environmentally sustainable development; government fiscal restraint; market demands and requirements of new trade agreements; the push for greater efficiency, productivity, and competitiveness; the management of new technologies, such as biotechnology; the trend toward greater diversification and value-added economic growth; and the need to create jobs.

As Agriculture and Agri-Food Canada continues to focus on protecting the resource base while addressing more fully the range of environmental issues associated with the broader public good, we must do so in a climate of fiscal austerity. Fortunately, we have strong and fruitful partnerships with the sector and the provinces and a good track record of dealing with environmental issues. We can help continue the transition to sustainable agriculture and agri-food production in Canada by staying in tune with sectoral and public needs, targeting funds to priority projects, helping the sector adapt to the new climate of business and respond well to new opportunities, and streamlining our own way of doing business. This strategy aims to help the agriculture and agri-food sector address its environmental challenges and capitalize on its environmental opportunities (*see* Box).

Environmental Challenges and Opportunities

On the farm and in the plant, environmental progress can be made through sound management of activities and efficient use of resources. These environmental challenges and opportunities can be described as follows:

- to enhance water quality in agricultural landscapes and adjacent areas — levels of contaminants in water from agricultural run-off, leachate, and processing effluent are reduced;
- to conserve water resources in agricultural landscapes and adjacent areas — water resources for production and processing are used efficiently;
- to conserve and enhance the health and productivity of agricultural land and soil — soil degradation processes such as erosion, salinization, compaction, and loss of organic matter are reduced;
- to conserve biological diversity used and affected by agriculture at the genetic, species, and ecosystem levels — crop and livestock genetic resources are used and preserved; non-pest species within or adjacent to agroecosystems are unharmed;
- to contribute to the stabilization of greenhouse gas emissions and minimize the emissions of ozone-depleting substances.

Issue Scan: Production Trends and Environmental Issues

Setting the Scene

This scan of the environmental issues in agriculture and agri-food production sets the scene for the department's activities for environmentally sustainable development. Detailed profiles of production in the agriculture and agri-food sector and the environmental issues it faces are given in a separate document entitled *Profile of Production Trends and Environmental Issues in Canada's Agriculture and Agri-food Sector.*

Agriculture and Agri-food Production

Canada's agriculture and agri-food industries contribute importantly to the nation's food security and economic health by:

- producing almost 9% of the Gross Domestic Product (2.1% from farm-level agricultural production, 2.3% from food and beverage processing, and 4.3% from food service and retail transactions);
- making yearly sales of goods and services amounting to more than $83 billion;
- generating about $17 billion in exports each year, 7% of all Canadian exports;
- contributing almost $5 billion to Canada's positive trade balance, 17% of the total;
- providing employment for about two million Canadians, 15% of Canada's total employment.

The trend in primary agriculture has been toward increased production of most commodities on fewer and larger farms that are more specialized. Major commodity groups are grains and oilseeds, red meats, dairy, horticulture, poultry and eggs, and forages. The food- and beverage-processing industry is very diverse and includes large trans-national corporations, large and small cooperatives, and many small to medium independent food companies. The value of production increased marginally over the past decade but is expected to grow in step with government and sectoral efforts to increase value-added production.

The major economic factors in farm production are commodity prices and on-farm costs of production. Commodity prices are influenced by market demand, domestic and international agreements, and government policies and programs, such as supply management. On-farm costs of production are influenced by a variety of farm management factors, including the management of agricultural resources and economies of scale. Technological factors that influence production include farm machinery, access to farm inputs, and crop and animal genetics. Physical factors include length of growing season, precipitation, inherent soil fertility, pest pressures, and landscape structure. Availability of unprocessed goods, proximity to markets, and numerous other socio-economic factors determine the products and siting of food- and beverage-processing facilities.

Farming is at the very heart of how we use our land in Canada. Asked which land uses they valued most highly, 51% of Canadians identified space for farming and providing food, followed by wildlife habitat (22%), space for housing and people (10%), providing lumber and paper from forestry (4%), various combinations of these (10%), and others (1%).

The Environmental Monitor, June 1996

Environmental Issues

The nature of factors affecting agriculture, alone and in combination, varies a great deal across Canada, and many diverse agricultural production systems have evolved. The environmental risks of agricultural production also vary significantly as a function of the nature of production, the environment in which production takes place, and the management practices employed. Environmental issues associated with agriculture and agri-food production include use and management of agricultural inputs; use and quality of water resources; management and quality of soil resources; biodiversity in agroecosystems; climate and air quality issues; and management of waste, including food packaging.

Land and Soil

Most of the land in Canada suited to agriculture is already in production. Although the total amount of farmland is holding steady, important changes have occurred within the agricultural land base, such as reductions in summerfallow area, shifts in cropping patterns, more intensive production in some areas, and conversion of prime farmland to non-agricultural uses.

The development and use of soil-conserving practices has increased significantly since 1981. As a result, some agricultural soils are improving in quality and becoming less susceptible to degradation. Although wind and water erosion risks have decreased since 1981, adoption by producers of soil conservation practices is far from complete, and many areas remain at high risk of soil degradation.

Agricultural Inputs and Water Quality

Many producers are using and managing inputs of fertilizer, manure, and pesticides in an environmentally sound manner, but opportunities to improve management of farm inputs exist.

Structural changes in the intensity, concentration, and specialization of agricultural production have created nutrient surpluses in many of the humid and intensively farmed regions of Canada. Nitrate introduced by agricultural activities is present in nearly all groundwater underlying the principal, intensively farmed regions of Canada, but levels are usually within the safe limit. Bacteria are sometimes also detected at elevated levels, but pesticides are usually within safe limits. The prairie region is generally considered to be at lower risk of declining water quality resulting from agriculture than other regions.

Pesticide use in agriculture has levelled off in Canada since the mid-1980s, and new pest control products generally pose fewer environmental risks, although concerns remain about potential impacts on non-pest species and water quality.

Water Availability

Issues of water use are most significant in the prairie region where water availability is more limited. Several factors, such as public resistance to new, large-scale water development projects, enhanced agricultural

Prairie dugout

production, and possibly climate change suggest that efforts to further promote efficiency of water use are required.

Biodiversity

Agriculture depends on biological resources to ensure a diverse genetic base for crop and livestock development, to maintain soil health, and to control pests. However, some wild flora and fauna, such as pest species, compete for the same resource lands and cause economic damage to crops and livestock. Agriculture has adversely affected biodiversity at the species and ecosystem levels through restructuring of landscapes and use of chemicals, but it also contributes to the preservation of biodiversity through practices such as conservation tillage, planting shelterbelts, and maintaining farm woodlots and rangelands.

Climate

Research is under way into potential impacts of climate change on agriculture and adaptation strategies. In 1991, the sector used about 246 tonnes of methyl bromide, an ozone-depleting chemical, and in 1994 contributed about 6% of Canada's estimated net greenhouse gas emissions, or about 39 million tonnes of carbon dioxide equivalent, which represents a 12% decrease from 1990 estimates. The sector is working in accordance with internationally agreed targets to reduce its consumption of methyl bromide and to develop alternatives. It can also contribute to Canada's target for greenhouse gas stabilization by controlling greenhouse gas emissions and adopting practices that sequester carbon in soils.

Air Quality

The key environmental issues relating agriculture to air quality include impact of local air quality from livestock wastes and the long-range transport of substances emitted from agricultural sources, such as nitrogen fertilizer. Changes in land use planning and improved methods of manure storage and handling can contribute to addressing these

issues, but more work is needed to fully understand the relationship of Canadian agriculture to air quality.

Environmental Issues in Food and Beverage Processing

The key environmental challenges faced by the food- and beverage-processing industry are reducing packaging wastes sent to landfill sites; using production inputs (such as water and energy) efficiently; minimizing discharges to air, water, and land; and complying with environmental regulations. It is increasingly common for food processing, beverage processing, and distribution companies to include environmental management systems in their operations, and efforts to reduce product packaging waste are under way.

Environmental Outlook

The environmental future for Canadian agriculture and agri-food could be shaped by various social and economic forces, including the world's demand for food; commodity and input prices; federal, provincial, and municipal government policies; international trade agreements; technology; and agricultural research. It is likely that the interaction of these forces will result in the continued restructuring of the sector.

The food- and beverage-processing industry is working to enhance its competitiveness, productivity, and export performance. It will be important to ensure

that economic progress is accompanied by environmental gains, such as compliance with effluent discharge regulations, efficient use of resource inputs, and continued progress in reducing packaging wastes.

Primary production agriculture will need to significantly increase production on existing cropland if the food and non-food requirements of both domestic and international markets are to be met without encroaching on marginal or non-agricultural lands. This will likely mean continued intensification and concentration of production in both crop and livestock commodity sectors, and potentially increased environmental risks.

Over the past 15 years, the sector has made considerable progress in adopting more sustainable production technologies, systems, and methods, but important challenges remain. The key environmental issues facing agriculture in southern British Columbia are impacts on water quality resulting from heavy application of fertilizers and manure, and conversion of farm land to urban use. The prairie region, including the Peace River district of British Columbia, must continue to deal with soil degradation risks (e.g., erosion, salinization), market pressures to seed more land to annual crops (e.g., wheat), the expansion of livestock operations, and risks to water quality in areas such as high-density feedlots and intensively irrigated soils receiving manure. The most important environmental concerns in central Canada continue to be the effect of nutrient surpluses on water quality; soil degradation, including compaction and erosion losses; and rural–urban interactions on issues such as odour from livestock operations and conversion of farmland to other uses. Atlantic Canada will continue to increase production of high-value specialty crops (mainly potatoes), with their related risks of soil erosion and impacts on water quality by agri-chemicals. To meet such challenges, decision makers at all levels in the sector must have access to the tools, incentives, and information they require to move toward environmentally sustainable agriculture. Unless increased intensity of production is accompanied by sound land use planning and good management and production practices, the environmental sustainability of agriculture and agri-food industries could be compromised. The environmental challenges facing the sector are significant but manageable. The stewardship practised over the past decades in the sector must continue to evolve to protect the broader environment.

Strategic Direction 1

Increasing Understanding

STRATEGIC DIRECTION

Improve the capacity of departmental and sectoral decision makers to integrate environmental factors into day-to-day decision making.

PRIORITIES

Focus and enhance the department's analytical capabilities and provide timely and appropriate information to encourage greater integration of environmental factors into sectoral and departmental decision making.

Integrate environmental sustainability objectives into departmental policies, legislation, and programs.

The Need for Good Information

An increasingly important role of government is providing information to industry decision makers to help them consider the environmental consequences of their management practices and investments when making business decisions. Government policy makers also need good analysis to understand how their policies and programs affect the environment. And the Canadian public has a right to receive reliable and scientifically verifiable information about the environmental state of the agricultural landscape. *Increasing Understanding* is an important strategic direction that acknowledges that Agriculture and Agri-Food Canada must improve its capacity to gather and interpret the information needed by our clients.

Environmental Integration

By providing good information and analysis and collaborating with our sectoral and provincial partners, we can assist the sector to build environmental sustainability into its modes of business and to make decisions in anticipation of environmental effects, rather than in reaction to them. As many producers and processors have come to realize, this is the most cost-effective method of addressing environmental concerns and working toward sustainable agriculture in Canada.

Planning for Climate Change in Southern Alberta

"My family has farmed for three generations in the Palliser Triangle, a very dry part of the Prairies," says Norm Storch of Hanna, Alta. "Dryland farming requires flexibility. My father and grandfather stayed through the dust bowl in the '30s, and their experience has helped to make me very conservative. We know we have to farm with the environment."

Now raising cattle and lamb for the local market as well as growing forage grasses and cereals, Storch and his family are planning to combat the effect continuing climate change might have on their farm. "The first indicator of climate change is extremes in temperature. The hot times are hotter and the cold days are colder. A week's worth of unusually hot days in late August with a south wind, and I could lose a year's worth of crops," says Storch.

Storch now seeds crops in the fall that will mature earlier, so any hot August days will help rather than hurt his crop. He minimizes disturbance of the soil by direct-seeding, and also plants more forage crops. "If I get a good crop, I can cut it for hay. If not, then I turn the cattle out to pasture and they harvest it for me," says Storch.

Looking for ways to diversify his farming operations and put his belief in action, Storch has planted 2,000 Saskatoon trees. They'll be ready to harvest in three years and will produce for 60 years. "There are two points at which to plant a tree or an idea," says Storch. "The first is 50 years ago. The next is today."

"Through this strategy, Agriculture and Agri-Food Canada is making a series of commitments to provide the sector with information, marketing tools, research, technology, systems and practices that will help maintain the momentum generated under the Green Plan over the last several years."

Hon. Ralph Goodale, Canadian Federation of Agriculture AGM, February 1997

Environment–economy integration is an important element of the federal government's jobs and growth agenda. Agriculture and Agri-Food Canada has a role to play in raising awareness of the importance of pursuing eco-efficient production methods to enhance the environmental sustainability and economic growth prospects of the sector.

In addition, an integrated approach to policy and program design is one of the best ways to achieve environmental progress. For example, we have begun to build environmental thinking into our activities by assessing environmental issues and factoring them into the design of crop insurance, income support programs, and adaptation initiatives (*see* Box).

Types of Information

Ecological and Resource Information

Agriculture and Agri-Food Canada provides certain types of resource information, such as data from the Canadian Soil Information System (CanSIS), which can be used to assess the status of Canada's land resources and the sustainability of land management practices. Better information is needed about agriculture-related water quality, as well as biodiversity and wildlife habitat in agroecosystems. The department can supply some biodiversity information from, for example, our taxonomic catalogues on insects, mites, vascular plants, and fungi and inventories of wild plants and animals. However, there still remain large gaps in the knowledge about biodiversity on agricultural land, particularly wetlands and woodlands.

Environmental Twist on Adaptation and Rural Development

The Canadian Adaptation and Rural Development Fund is designed to help eligible farm groups, agri-businesses, and rural communities as they adapt to changes taking place in the sector. These changes include trade liberalization, policy and program changes, new environmental requirements, changes in consumer preference and demand, the need to reduce public debt, and technological change. The fund is also used to foster increased long-term growth, employment, and competitiveness in the industry and in rural communities.

Provincial adaptation councils, such as Investment Agriculture in B.C. and le Conseil pour le developpement de l'agriculture du Québec, are being set up to administer the federal adaptation fund and to receive proposals for local and regional initiatives. Environmental issues are now considered when deciding how these funds are distributed. For example, along with projects on marketing and rural and human development, Ontario's Agricultural Adaptation Council supports projects that strengthen the leadership and management of sustainable agricultural production and food processing, and protection of the agricultural land base. These projects will work to:

- promote the development and use of environmentally sustainable practices;
- promote the sustainability of water quality and increase water use efficiency;
- research, demonstrate, and evaluate new agricultural management practices;
- develop communication links that improve the transfer of technology to farm communities.

Agri-environmental Indicators

Work is now under way to develop a set of scientifically sound environmental indicators of the health of the agricultural landscape (*see* Box). These indicators will be useful for broad-scale interpretation of the environmental effects of sectoral and government activities, taking their place along with economic indicators as key tools for decision making. Through their development the department will be much better armed to integrate environmental

Agri-environmental Indicators

Environmental stresses cannot be managed unless they are understood, so tracking environmental progress on Canada's farmland is an important step toward sustainable agriculture. A good monitoring program depends on the careful selection and long-term assessment of *indicators*. These indicators — called agri-environmental indicators — measure the change, or the risk of change, in the state of environmental resources used or affected by agriculture, or in farming activities that affect the state of these resources.

In 1993, Agriculture and Agri-Food Canada began its Agri-environmental Indicator Project, with the objectives to:

- improve our understanding of the nature, extent, and location of environmental risks and benefits related to primary agriculture;
- track the agri-food sector's progress toward environmentally sustainable agriculture;
- support the design and targeting of agri-environmental strategies, policies, and programs;
- help integrate environmental considerations into decision-making processes.

Six indicators are being developed, each with several components. Although national in scope, they take into account regional variation. Progress reports on these indicators are periodically released, and a comprehensive assessment will be prepared in 1998–1999. The six indicators are:

Farm Resource Management
Tracks the adoption by farmers of environmentally sustainable practices.

Soil Degradation Risk
Measures progress in reducing the vulnerability of agricultural soils to degradation processes such as erosion, salinization, and loss of organic matter.

Risk of Water Contamination
Measures progress in reducing the risk of water pollution by crop nutrients.

Agroecosystem Greenhouse Gas Balance
Estimates trends in the balance of carbon dioxide, nitrous oxide, and methane resulting from agricultural activities.

Agroecosystem Biodiversity Change
Monitors biodiversity in agricultural ecosystems by measuring changes in habitat availability, and species diversity and abundance.

Agricultural Efficiency and Productivity
Tracks trends in agricultural productivity and efficient use of farm inputs.

considerations into policy and program development. They will allow us to assess our environmental progress, target strategies at high-risk areas, and better integrate environmental considerations into decision-making processes within the agriculture and agri-food sector. Developing these indicators is a high departmental priority.

Analytical Information

The department provides research studies and many other forms of analysis to sectoral and other clients. Examples include the costing of best environmental management practices, analysis of the effectiveness of various environmental policy instruments, and reviews of approaches taken in other countries to advance agri-environmental goals.

Consultations

The analysis we do as a department must be responsive to the environmental issues that the agriculture and agri-food sector faces. We need consultative mechanisms to ensure that we invest in developing information that is relevant to the decisions being made by the department and the sector, and that this information is effectively shared with stakeholders and the public.

Agriculture and Agri-Food Canada consults and communicates with the sector and with the general public through groups such as the federal–provincial sustainability accord committees and the National Agriculture Environment Committee (*see* Box). We also offer workshops, often in partnership with organizations such as the Canadian Federation of Agriculture, Environment Canada, and the National Agriculture Environment Committee, on issues such as reconciling private property rights with environmental policy objectives, environmental liability, economic instruments, biodiversity, and pollution prevention.

National Agriculture Environment Committee

Agricultural producers found an important voice when the National Agriculture Environment Committee was formed in 1994. Bringing together a wide range of producer groups from across Canada, the committee acts as a national forum to focus on environmental and sustainability issues in agriculture. These issues relate to resource conservation, awareness, and policies and strategies for agriculture.

The committee is dedicated to:

- developing strategies on key environmental issues with other stakeholders;
- providing clear and relevant information and analysis;
- demonstrating the vision and work of agricultural producers to achieve environmental sustainability;
- working cooperatively with other stakeholders for solutions;
- promoting research and development on sustainable agriculture.

Members include the Canadian Federation of Agriculture, provincial federations of agriculture (e.g., Keystone Agricultural Producers, Union des producteurs agricoles), Canadian Cattlemen's Association, Canadian Pork Council, Canadian Organic Advisory Board, Dairy Farmers of Canada, Prairie Pools Inc., Western Canadian Wheat Growers Association, Canadian Horticultural Council, Canadian Forage Council, National Farmers Union, Federated Women's Institute of Canada, and National Farm Women's Network.

Our Role

Industry and government agencies agree that water quality is the number one environmental issue facing the agriculture and agri-food industry today. We can provide information to farmers and food processors to help them understand how their activities affect water quality and otherwise affect the environment, so they can work to reduce the risks.

With Producers

Producers have identified areas where more and better information is needed to help them adopt practices that will most affordably address the effects of their farm operations on the environment. For example, the emergence of market opportunities for Canadian pork could result in increased manure production. However, the industry understands the environmental implications of this change and anticipates the need for proper manure management and disposal so that water quality is not threatened. Similarly, the trampling of riparian habitat by livestock affects the quality of both stream and river water, as well as wildlife habitat. Improved management of riparian areas can address these effects. The industry increasingly understands these issues and has asked Agriculture and Agri-Food Canada to improve its ability to provide information to help meet these challenges.

Cost analysis of best management strategies demonstrates how environmental planning can become part of an overall strategy for farm management. This kind of information must be accompanied by scientific information developed in a regionally sensitive way to help producers understand the risk of, for example, declining quality of surface- and ground-water resulting from farming. We are working with the hog industry to develop a model that shows that environmentally sound practices for manure management will likely reduce profits in the short term but enhance both profitability and environmental sustainability over the medium and long terms.

With Agri-food Industries

Agriculture and Agri-Food Canada can provide information about domestic and international preferences for environmentally differentiated products. Our market and industry services staff and research staff can work together to provide the industry with information about innovations developed in Canada or elsewhere that could have applications for local facilities, such as the conversion of waste discharges from fruit-, potato-, and ethanol-processing plants into commercially viable by-products.

With Government Decision Makers

Government decision makers need information tools to help them anticipate the environmental consequences of policies and programs. The development of a set of agri-environmental indicators is one tool in that tool kit. It is also important that models and methodologies be developed to identify how agricultural program options may influence natural resource use, to focus on agricultural activities that risk overexploiting natural resources, and to analyse and communicate trade-offs between various environmental and economic factors.

Federal Pest Management

In April 1995, responsibility for regulating federal pest management was consolidated in the new Pest Management Regulatory Agency (PMRA) under the Minister of Health. The PMRA processes applications for registration and determines the regulatory status of pest control products; conducts human health, safety, and environmental risk assessments and value assessments; develops and implements policies and guidelines; disseminates information and maintains effective communications with the public; and enforces legislation. Certain residual responsibilities have been left to Agriculture and Agri-Food Canada, including:

- providing policy input to Health Canada;
- managing the User Requested Minor Use Regulations, the User Requested Minor Use Label Expansion, and the new National Agriculture Pest Management Program of the Canadian Federation of Agriculture, which provides financial assistance relating to pesticide regulatory matters;
- carrying out a variety of activities, such as research and testing, related to departmental mandates.

The department's recently introduced integrated model has the capacity to assess the effects of policy changes on soil erosion in the prairie region and to link rates of wind and water erosion on the Prairies to farm management practices. In time we hope to develop a predictive capability for all key agri-environmental issues.

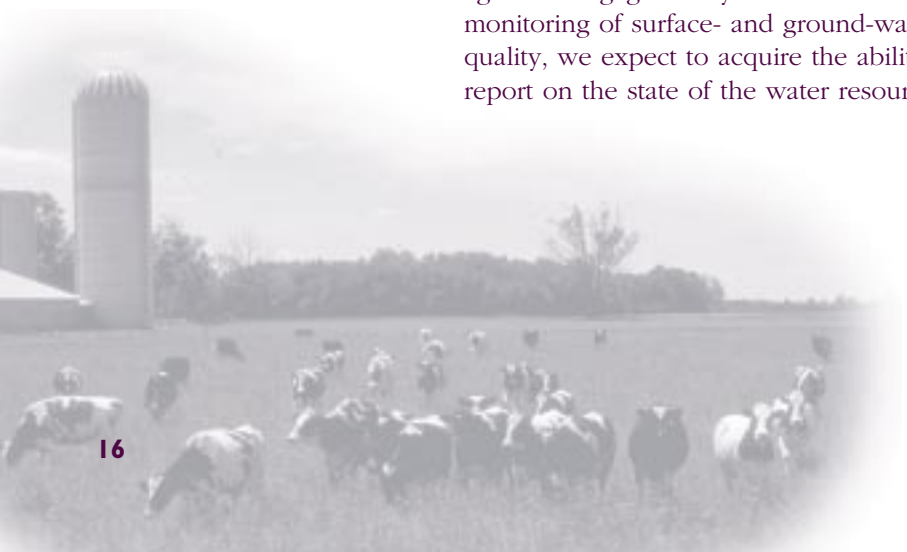
With the Canadian Public

Public opinion polls indicate that water quality is the chief environmental concern of Canadians. The department recognizes that though it must maintain and build on its existing areas of expertise, such as soil conservation, it also must build the capacity to assess and report on water quality and other agri-environmental issues on a national basis to satisfy the public's and sector's need for information. By working with local levels of government and other agencies engaged in systematic and regular monitoring of surface- and ground-water quality, we expect to acquire the ability to report on the state of the water resource in the agriculture landscape. We have already reported on the state of agricultural soils in our recently released book, *The Health of Our Soils — Toward Sustainable Agriculture in Canada.*

Similarly, the department has an important role to play in integrating environmental considerations into the manner in which it regulates new applications of biotechnology in agriculture. Genetic engineering is a new technology that can be combined with traditional agricultural methods to develop plants, animals, and foods with novel traits. There are many potential benefits of products derived from genetic engineering, including contributions to environmentally friendly production practices. Because many of these products are new, they are subjected to rigorous scientific scrutiny to maintain current high safety standards for consumers and the environment. The department has an important role to play in reviewing these products, to demonstrate to the public that they are safe for humans, animals, and the environment.

The Future

As we become better at collecting and analysing agri-environmental information, it will be possible to create national databases on issues such as agriculture-related water quality and biodiversity. This capacity will be built through the collaborative efforts of the department and its sectoral and provincial partners. Along with improved information, improved methods of distributing information will be put into place, capitalizing on new information technologies. By providing information that is responsive to the needs of both sectoral and departmental decision makers, the department can contribute substantially to integrating environmental considerations into the day-to-day decision making that affects agriculture and agri-food production in Canada. It is this increased understanding that this strategy is designed to effect.



ACTION PLAN 1 — INCREASING UNDERSTANDING

Priority 1

Focus and enhance the department's analytical capabilities and provide timely and appropriate information to encourage greater integration of environmental factors into sectoral and departmental decision making.

Actions

1997–98

1. Prepare discussion papers and hold workshops with sectoral and environmental partners on topics such as:

- possible linkages between environmentally sustainable farm management practices and health issues;
- market opportunities for food products combining high environmental and nutritional standards;
- approaches to encourage habitat protection;
- use of ISO 14000 environmental management standards.

1998–99

2. Develop and report a core set of agri-environmental indicators in cooperation with the Agri-environmental Indicator Advisory Committee.

Ongoing

3. Promote the use of electronic media, such as the Agriculture and Agri-Food Canada Electronic Information System and the Canadian Rural Information Service, as contact points for information on environmentally sustainable agriculture and agri-food production.

Ongoing

4. Promote environmental sustainability within the sector by continuing to support and work with multi-stakeholder groups, such as the National Agriculture Environment Committee, Soil Conservation Canada, Wildlife Habitat Canada, Canadian Federation of Agriculture, Canadian Cattlemen's Association, Union des producteurs agricoles, and the Canadian Agri-Food Research Council.

5. Develop and apply methodologies to assess the environmental, social, and economic impacts of departmental and sectoral decisions by:

1997–98

- developing an integrated economic–environmental modelling system to assess and predict impacts of policies and production decisions on soil, water, and climate change;
- conducting costing analysis and evaluating the financial and environmental impacts of alternative waste management decisions in livestock sectors;

1998–99

- identifying methodologies for valuation of agricultural resources in a national accounting framework;
- examining methods of accounting for the full range of environmental benefits and costs of agricultural production.

Priority 2

Integrate environmental sustainability objectives into departmental policies, legislation, and programs.

Actions

Ongoing

1. Review federal policies, programs, and initiatives aimed at rural Canada (such as those undertaken by local rural development organizations through the Canadian Rural Partnerships Initiative) to ensure that agri-environmental interests are taken into account.

1997–98

2. Enhance the capacity to conduct environmental analysis of new and existing policies and programs, and carry this out by:

- providing training and guidance, including methods to improve consideration of biodiversity in conducting such analysis;
- conducting environmental assessments for policies and programs meeting the established criteria.

Ongoing

3. Coordinate implementation of the *Canadian Environmental Assessment Act* and maintain the department's environmental assessment registry.

4. Enhance the capacity to conduct environmental assessments of products of biotechnology (including novel feeds, fertilizers, supplements, veterinary biologics, and plants with novel traits), and carry these out by:

1997–98

- developing regulations governing the notification and environmental assessments of these products;

Ongoing

- conducting pre-release environmental safety assessments.

1997–98

5. Amend regulatory development guidelines to include environmental assessment criteria.

1997–98

6. Develop new standards and regulations for contaminants (e.g., metals, pathogens, sharp foreign objects, organic chemicals) in fertilizer products and animal feeds, and assess existing ones.

Strategic Direction 2

Promoting Environmental and Resource Stewardship

STRATEGIC DIRECTION

Promote the stewardship and sustainable use of the environment and agricultural resource base by the agriculture and agri-food sector.

PRIORITIES

Develop mechanisms to encourage adoption within the agriculture and agri-food sector of practices that enhance multiple-use benefits and stewardship of natural resources.

Integrate environmentally responsible approaches into the management of the physical operations of the department by:

- meeting or exceeding federal environmental regulations;
- using best practices;
- developing and implementing an Environmental Management System.

The Need for a Stewardship Ethic

Wise stewardship of natural resources is the foundation on which the future of Canada's agriculture and agri-food production will be built. Farmers have understood this for many years and have sought ways to protect their farmland soils from erosion and other degradative processes. As more has become known about how some farming practices contribute to land degradation, many farmers have been eager to try new soil-conserving techniques and products.

Today there are clear signs that a stewardship ethic is growing in the agriculture and agri-food community. Farmers throughout the country have formed rural conservation clubs, adopted conservation tillage and precision farming techniques, developed environmental farm plans (*see* Box) and codes of practice, and made land use changes to enhance biodiversity. Food processors are reducing packaging waste and curbing effects on water quality through effluent treatment. These activities have resulted in many environmental successes — reduced risk of soil erosion by wind and water, enhanced wildlife habitat, the control or elimination of potentially

Environmental Farm Plans

Achieving harmony between agriculture and the environment starts on the farm. Through such programs as the Atlantic Environmental Farm Plan Initiative and Ontario's Environmental Farm Plan Program, farmers are improving their environmental performance by custom designing and following an *environmental farm plan*.

An environmental farm plan is made up of a farm review and an action plan. In the farm review, farmers identify areas of potential environmental risk on their farms by looking at their buildings, livestock and manure management, soil and crop management, and sensitive ecological areas. Using guidelines and a rating system, farmers can zero in on their biggest environmental problems. Based on this review, they can then make an action plan to address these problems. The beauty of the plan is that farmers know their systems best and can build the plan around specific needs, taking into account the time and money available to do the work.

Drawing up an environmental farm plan is strictly voluntary, but thousands of farmers are jumping at this opportunity to take charge of environmental change. It's not hard for them to see that good land stewardship promotes healthy farm families and prosperous rural communities.

"I firmly believe that farmers are among the most responsible and sensitive of environmental stewards."

Hon. Ralph Goodale, Agriculture Forum on Climate Change, January 1996

Watercolour painting by Wendy Kroeker, 2nd place winner in the 1996 Growing for Tomorrow sustainable agriculture contest sponsored by the Canada–Manitoba Agreement on Agricultural Sustainability. As depicted here, healthy riparian areas are buffer zones between productive farm land and waterways, stabilizing stream banks and providing vital wildlife habitat.

toxic compounds found in many products used in agriculture, and reduced landfill loading and impacts on water. *Promoting Environmental and Resource Stewardship* is an important strategic direction that will build on these successes and take agriculture and agri-food industries several steps further toward environmental sustainability.

Environmental Integration

Many farm practices that conserve resources and reduce the risk of soil degradation can also minimize environmental impacts and enhance multi-use benefits. For example, growing perennial vegetation on land prone to soil degradation can reduce soil erosion, protect the aquatic environment by reducing nutrient run-off, provide wildlife habitat, promote biodiversity, and improve the appearance of the landscape.

One Stream at a Time

Water from the Esprit watershed in the Quebec Laurentians makes its way to the Esprit River, which empties into the very polluted Assomption River and then into the St. Lawrence. All along the way, it picks up bacterial coliform, sediments, nitrates, and phosphorus from farmland, adding these to the already heavy load of domestic and industrial pollutants in the rivers. This picture caused dismay for Pierre Paul Ricard and other farmers in the region. "We had the impression we were contributing to poor water quality in our own region. So, we decided to do something about it," says Ricard.

Funded by Green Plan money, Ricard and other farmers in the region hired agriculture environmentalist Eric Léger. "My job is to work with the farmers," says Léger. "We have scientific advisors, but the project management board decides what will be done." Five farmers sit on the board, one as president. "They ensure practices are changed at a reasonable pace, while watching the effect on their economic return. We take three components into consideration for all decisions — agriculture, economics, and environment," says Léger.

Léger advised methods to reduce fertilizer run-off. Farmers in the region now reduce tillage, leave more crop residue on the soil surface, plant a fall cereal crop to hold nutrients in the soil, and apply fertilizer only when crops need it most. After three years of using these methods there are still no big improvements in water quality, but 200 years of farming in this region has taught farmers to be patient. "It will take several years to be able to measure a change," says Léger confidently. Meanwhile, Ricard and his neighbours have the pleasure of knowing they're doing something practical to improve the environment at their doorstep.

Growing scrutiny of the agricultural community for the effects of its practices on environmental health calls for direct attention to environmental protection and an integration of environmental considerations into agricultural planning. The environmental impacts of agricultural activities are often diffuse (unlike pollution from the manufacturing industry, which comes from a point source), and it has been difficult for enforcement agencies to trace them to the farmer responsible. As a result, agricultural impacts on the environment have been difficult to regulate, and farm source pollution standards have not been set and enforced as they have been for manufacturing industries.

The food processing industry also faces a number of challenges to reduce environmental impacts. Atmospheric emissions and liquid effluent are now regulated provincially, but reducing the amount of food packaging waste sent to landfill sites remains a major task. This issue is a shared responsibility, and the food industry, consumer groups, and various government agencies, including Agriculture and Agri-Food Canada, work together on the National Task Force on Packaging to reduce waste volume. A number of processors demonstrate their commitment to environmental stewardship by exceeding the requirements of provincial regulations. Nevertheless, there is a continuing need for industry to integrate principles of environmental sustainability into their business plans and to adopt new ways of preventing environmental impacts.

Potential impacts on the environment arising from agricultural and agri-food activities include:

- impact on water: by the entry of soil sediment, agri-chemicals, livestock wastes, fuels, organic waste water;
- impact on soil: by the addition of agri-chemicals, heavy metals and industrial contaminants (applied in sewage sludge), disposed waste (including packaging);
- impact on air: with the presence of odours, dust, agri-chemical drift, greenhouse gases, ozone-depleting substances, noise.

Shift in Focus

The shift in focus from "cleaning up" to "prevention" is embodied in *Pollution Prevention — A Federal Strategy for Action*, released in June 1995. This strategy puts forward a hierarchy of activities to deal with pollution, ranking prevention as the most effective means of protecting the environment and promoting sustainable development. By taking a preventive approach we can avoid costly clean-up and enforcement, reduce liability and regulatory uncertainty, improve efficiency and savings, and spur the development of pollution prevention technologies.

Pollution Prevention Hierarchy

Methods of Dealing with Pollution	Agricultural Examples
PREVENTION	Adopting environmentally sound farming practices, process modification or alternative chemical use in the agri-food industry, awareness building, research.
RECOVERY	Collecting and reusing oil or pesticide containers, producing alternative sources, using straw in non-food products, restoring wetlands, composting.
CONTROL	Proper storage and handling of manure, pesticides, milkhouse waste.
DISPOSAL	Disposal of used anti-freeze, fuel, fertilizer, pesticides.
REMEDIATION	Decontaminating aquifers, reclaiming eroded or degraded sites, improving private wells.

Environmental liability is an issue of growing concern to farmers because of the barrier it imposes on the availability of capital, operating financing, and adequate environmental insurance coverage. Their efforts to demonstrate stewardship and prevent pollution are two important elements of reducing the risk of environmental liability.

Our Role

The challenge for Agriculture and Agri-Food Canada with respect to promoting environmental and resource stewardship is three-fold:

- to work with the sector to broaden the stewardship ethic to encompass the broader off-farm or downstream environmental effects;
- to develop innovative and cost-effective tools and mechanisms to help the sector minimize the environmental impacts of its day-to-day business;
- to integrate stewardship and pollution prevention into the department's decision making related to programming, research, analysis, and operations.

Decision Making

The pollution prevention hierarchy needs to be integrated into decision making throughout the sector, with an emphasis on top-end activities that prevent pollution. Stewardship at the farm level means taking environmental factors into account in farm operations, which may require practices from all levels of the hierarchy.

Managing Agri-chemical Containers

In 1989 the Crop Protection Institute, representing the manufacturers, formulators, and distributors of crop protection products, began a program to manage empty pesticide containers. At that time the crop protection industry targeted a 50% reduction in packaging waste by 1995. This goal is being achieved mainly through the efforts of individual companies that know the value of the three Rs:

Reduce — The demand for containers has dropped as new crop protection products requiring less packaging come on stream.

Reuse — More than 60,000 refillable, multi-trip containers are now used in Canada for crop protection products.

Recycle — Container management programs across Canada handle the collection, shredding, washing, and recycling of used agri-chemical containers, particularly those made of high-density polyethylene or steel. Canadian farmers control the success of these programs through their commitment to return clean, empty containers to designated collection sites. Products made from recycled materials include plastic fence posts and guard rails.

Funds to run the recycling programs have been contributed by manufacturing companies (through a levy placed on one-way containers) and administered by the Crop Protection Institute. The funds also support grower education programs and research in occupational health and safety, toxicology, and leachability testing of recycled products. The success of this program has made Canada's crop protection industry a world leader in recycling empty agri-chemical containers, demonstrating what can be done when industry, farmers, governments, and agricultural partners work together to realize a common goal.

Agriculture and Agri-Food Canada also needs to integrate the pollution prevention approach into decision making related to core budget activities, research and development initiatives, and adaptation funds. The hierarchy can be used as a tool to assess proposals for adaptation programming, encouraging the sector to search for innovative and cost-effective options for environmental decision making. The department must work to ensure that adaptation initiatives result in practices that are environmentally sustainable over the long term.

International Activities

Stewardship drives a number of international environmental initiatives. In partnership with the sector, the department's involvement has included:

- developing a biodiversity action plan for agriculture in response to the *Convention on Biological Diversity* (*see* Box);
- participating in the development of a National Action Plan for the Protection of the Marine Environment from Land-based Activities as part of a Global Plan of Action;
- participating in the phase-out of methyl bromide and cooperating in research to find alternatives;
- developing guidelines for replacing CFCs and HCFCs in refrigeration equipment;
- participating in the development of a Canadian position on the safe transfer, handling, and use of living modified organisms;
- working to ensure that Canada's National Action Plan on Climate Change (developed in response to the *Framework Convention on Climate Change*) includes measures currently being taken by producers to reduce greenhouse gas emissions or increase carbon fixation in soils.

Boosting Biodiversity

Biological diversity, or biodiversity, is the wide range of characteristics found among living organisms and their ecological settings. This diversity is commonly described at the genetic, species, and ecosystem levels. Preserving biodiversity is a key activity in sustaining the earth's resources and productivity for the future. In December 1993, Canada became the first industrialized country in the world to ratify the international *Convention on Biological Diversity*, presented at the 1992 Earth Summit in Rio de Janeiro. To help meet obligations under the convention, federal, provincial, and territorial governments worked together to develop the *Canadian Biodiversity Strategy*.

Working with partners in the agri-food sector, research community, and interest groups, Agriculture and Agri-Food Canada is developing an action plan on biodiversity to guide the department in following the *Canadian Biodiversity Strategy* and to discuss its meaning in an agricultural context. The action plan has four main goals:

- to promote sustainable agroecosystems while respecting natural ecosystems;
- to increase awareness and understanding of biodiversity in agriculture;
- to conserve and facilitate access to genetic resources that are important to agriculture, and share knowledge, expertise, and technologies in a fair and equitable way;
- to integrate biodiversity conservation objectives in departmental policies, programs, strategies, regulations, and operations.

Ducks on the Family Farm

Canadian Wildlife Service

Prairie CARE, which stands for Conservation of Agriculture, Resources, and the Environment, is a program under the North American Waterfowl Management Plan (NAWMP) that supports educational and collaborative projects at the farm level. The program is designed to help farmers improve land use while making things easier for ducks and other wildlife. "We offer to trade better grazing lands in exchange for improved wetlands conservation on a farmer's property. We design grazing plans that improve the grasslands for the ducks and improve the grazing for the cattle. We lease some land if it helps secure prime prairie wildlife habitats," says Kenn Gurr, NAWMP's spokesperson in Alberta.

Under a Prairie CARE land lease agreement, Alvin and Gordon Sorensons' farm in Viking, Alta., is benefiting from wetland restoration and stabilization of a highly saline area. In return, the brothers seed 200 acres with grasses and alfalfa where ducks can nest, and they delay cutting until after the ducks finish nesting. "We've learned some new techniques too," say the Sorensons. "On marginal areas where only weeds grew before, we've planted grasses. We cut it for cattle feed and to prevent the weeds from reseeding. This reclaimed land and other changes have helped us make our farm viable."

More than 4,000 Alberta farmers have been involved in NAWMP's program, now one of the largest habitat conservation projects in history. Under this plan, more than 112,000 acres of large and small wetlands have been protected, more than 41,000 acres of grassland have been restored, and almost 170,000 acres of native grasslands and other habitat have been preserved.

The department will continue to work with the sector to represent Canada's agri-environmental interests in environmental forums, to meet Canada's international commitments, and to develop means of implementing current environmental agreements.

Promoting Industry Involvement

By reducing, reusing, and recycling food packaging material appropriately, food industry stakeholders are well on their way to meeting their National Packaging Protocol reduction target of 50% of 1988 levels by 2000 (*see* Box). Agriculture and Agri-Food Canada's involvement has included promoting the industry principles behind initiatives to reduce packaging and funding related projects under the Green Plan Sustainable Agriculture Initiative. The department will continue to provide information on the environmental challenges facing the industry and to promote industry efforts to address environmental issues.

Putting Our Own House in Order

Stewardship and pollution prevention must also be built into decisions related to the department's landholdings, assets, and physical operations. Agriculture and Agri-Food Canada owns about 1,800 buildings on 33,000 hectares of land; occupies 81,000 square metres of office space; and operates numerous research establishments, laboratory complexes, and ports of entry. The department also operates 87 Community Pastures on about 930,000 hectares of pasture, to promote the sustainable, productive use of erosion-prone land and to assist farmers in diversifying and adapting their operations.

The department has undertaken a number of stewardship initiatives to ensure that our house is in good environmental order, including managing contaminated sites, underground fuel storage tanks, hazardous waste storage facilities, heating-plant boiler emissions, and the storage and disposal of PCBs. Corporate Services Branch is currently leading the development of a more systematic approach to environmental management through the implementation of an Environmental Management System. This management framework will incorporate

Cutting Packaging Waste

By the year 2000, the Canadian Council of Ministers of the Environment wants to see food packaging wastes cut to 50% of their 1988 volume. The Canadian food industry has already contributed greatly to meeting this goal. The 1992 interim target of 20% has been met, and work is under way to measure the success in meeting the 1996 target of a 35% reduction.

Reducing packaging waste is a job for everyone — consumers, environmental groups, industry, and government. All these groups are represented on the National Packaging Task Force, set up to see that the job gets done. The task force has developed a National Packaging Protocol that challenges industry to promote sustainable development by practising product stewardship — taking responsibility for their products and packaging from start to finish. The goal is to design, manufacture, fill, use, and dispose of packaging in such a way as to minimize its effect on the environment and to reduce landfill loading by applying the three Rs: Reduce, Reuse, Recycle.

Specific waste-cutting targets are being set for the various sectors in the industry. Industry and trade associations encourage their member companies to commit themselves to the policies and targets stated in the National Packaging Protocol. Such a commitment will include developing industry-specific codes of preferred packaging practice and preparing action plans to meet or exceed the targets.

Permanent cover

Feedlot management

Shelterbelt

Crop residue cover

compliance with environmental laws, best practices, and quality-management principles to continually improve all aspects of departmental operations, including management of procurement, assets, and the department's fleet, buildings, and land.

The Future

Despite these achievements, the agriculture and agri-food sector is under scrutiny for its impacts on the environment and implications for human and environmental health. However, techniques to detect non-point source pollution are improving, and pollution prevention represents an opportunity for the sector to be a greater part of

the solution. By working closely with our sectoral and other partners, the department can contribute to improved sectoral environmental and resource stewardship.

The sector's long-term success depends on its ability to carry out its business based on a broad stewardship ethic that recognizes the sector's place in Canada's ecosystems. Improving the sector's environmental performance involves conserving resources and addressing off-site effects on the environment, particularly by preventing environmental damage. Agriculture and Agri-Food Canada will practise good stewardship and environmental protection in its own operations and will carry out activities to help the sector in its efforts do the same.

ACTION PLAN 2 — PROMOTING ENVIRONMENTAL AND RESOURCE STEWARDSHIP

Priority 1

Develop mechanisms to encourage adoption within the agriculture and agri-food sector of practices that enhance multiple-use benefits and stewardship of natural resources.

Actions

1998–99

1. Work with sectoral partners to identify and promote best practices and approaches to environmental farm planning.

1998–99

2. Work with sectoral partners to analyse and report on:

- the linkages between agricultural practices and water resources;
- best management practices to improve on-farm and off-farm water quality and water use efficiency.

1997–98

3. Work with regional industry adaptation councils established under the Canadian Adaptation and Rural Development Fund to design environmental criteria for evaluating sectoral funding proposals.

1997–98

4. Work with the Canadian Farm Business Management Council to better integrate environmental farm management elements into its larger farm business management programming.

1997–98

5. Conduct analysis of the various types of voluntary approaches to encourage resource stewardship, for example, the concept of "covenants" and their potential for use in the sector.

Ongoing

6. Contribute to the activities of the National Task Force on Packaging and Environment Canada to reduce packaging waste from food products.

1997–98

7. Work with the sector to identify and review approaches to assess the environmental benefits of agriculture, including examples from OECD countries.

8. Encourage the wildlife benefits of private farmland by:

1997–99

- supporting the Canadian Federation of Agriculture/Wildlife Habitat Canada initiative to explore potential links between beneficiaries of wildlife, such as naturalists and hunters, and farmers, who are stewards of an important component of Canada's wildlife habitat;

Ongoing

- continuing programs that help offset costs associated with spot damage to crops from migratory waterfowl, where complementary prevention programs are in place.

Ongoing

9. Manage Community Pastures to ensure long-term conservation of marginal lands and critical wildlife areas by:

- involving stakeholders in the development, resourcing, and implementation of strategies and action plans (e.g., livestock production, biodiversity, endangered species, carbon sequestration);
- undertaking re-vegetation projects using native species.

Ongoing

10. Work with sectoral and provincial partners to improve water quality and reduce land degradation in the Prairies by:

- helping to develop and implement water supply and conservation plans;
- planning and developing water supplies for domestic, industrial, and irrigation purposes;
- developing technical options and practices to reduce land degradation;
- providing tree materials for field shelterbelts, riparian areas, and wildlife habitat planting;
- conducting demonstrations and field days, and producing fact sheets on sustainable land use and management practices, and issues of water quality and quantity.

Implementing International Commitments: Work with the sector to represent Canada's agri-environmental interests, to meet Canada's commitments, and to develop means of implementing current environmental agreements.

1998–99

11. Work with sectoral partners to implement AAFC's Action Plan for Biodiversity, including such actions as:

- building state-of-the-art facilities for the conservation of seed-crop genetic resources and continuing to maintain and operate the crop-specific genebanks for potatoes, cereals, oilseeds, forages, special crops, and hardy ornamentals;
- developing major systematic treatments, identification guides and taxonomic catalogues on, for example, insects, mites, bioindicators of soil and water quality, insect biocontrol agents, weeds, and aquatic plants;
- strengthening national collections, such as the Canadian National Mycological Herbarium and the Canadian National Collection of Insects and Arachnids;
- developing mechanisms to facilitate access to samples of genetic resources and biological specimens preserved by AAFC, including those in Community Pastures;
- implementing the requirements of the proposed *Canada Endangered Species Protection Act*.

1997–98

12. Assist the sector in meeting the Montreal Protocol commitments on reductions in methyl bromide use by:

- coordinating joint industry–government initiatives to develop alternatives to methyl bromide;
- organizing workshops related to alternatives;
- supporting the Industry–Government Methyl Bromide Working Group.

1997–98

13. Work with the Climate Change Working Group of the National Agriculture Environment Committee to identify measures and targets for reducing greenhouse gas emissions from Canadian agriculture, for inclusion in Canada's National Action Plan on Climate Change.

Ongoing

14. Work with the sector to represent agri-environmental interests in domestic and international environmental forums, and in the development of international negotiating positions related to, for example:

- promoting the sound management of chemicals (e.g., ammonia, persistent organic pollutants, heavy metals) by the agriculture sector;
- protecting the marine environment from agricultural sources of pollution;
- ensuring sustainable use, access, and conservation of global genetic resources for food and agriculture.

Priority 2

Integrate environmentally responsible approaches into the management of the physical operations of the department by:

- **meeting or exceeding federal environmental regulations;**
- **using best practices;**
- **developing and implementing an Environmental Management System (EMS).**

1997–98

1. An EMS will provide the framework for Agriculture and Agri-Food Canada to: 1) apply environmental stewardship to its operations and to monitor its environmental performance; and 2) ensure a high level of environmental performance and accountability in departmental operations, such as construction and operation of buildings, fleet management, and land utilization.

ACTIONS WILL BE DEVELOPED AS PART OF THE EMS PROCESS, AND WILL BE REPORTED BY DECEMBER 1997.

Strategic Direction 3

Developing Innovations and Solutions

STRATEGIC DIRECTION

Focus research, development, and technology transfer to address environmental challenges and foster sustainability in the agriculture and agri-food sector.

PRIORITIES

Through research and development, increase the availability to industry of commercially viable systems and technologies to address on- and off-farm environmental effects of agricultural activities.

Identify areas at most environmental risk.

The Need for Sound Science

Agriculture and Agri-Food Canada recognizes that sound science plays a critical role in understanding and solving environmental problems. An important tenet of the department's research programs today is to ensure that Canadian agriculture is environmentally sustainable.

Our environmental research continues to evolve as agriculture and its effects on the environment become better understood and as the public makes new demands for scientific analysis and problem solving. *Developing Innovations and Solutions* reflects this need to respond to the most pressing environmental issues facing the agricultural and agri-food sector today and over the next several years.

Environmental Integration

Integrating environmental considerations into ways of doing business is enhanced by making appropriate innovative technologies available to the sector. The challenge for our Research Branch will be to help give clients a competitive edge in business without endangering the resource base on which future productivity depends. The branch already has a strong record of responding to environmental issues and producing innovations that improve the competitiveness of the sector.

Research for the Public Good

The Research Branch of Agriculture and Agri-Food Canada carries out research of national significance that the farming community and industry cannot conduct profitably working alone. Our researchers do not compete with the private sector, but collaborate with them to make the best use of scientific and financial resources.

Research on ways to prevent and remedy inadvertent environmental damage resulting from agricultural activities is one area in which the private sector has been less inclined to invest, mainly because it is generally viewed as a public good. For the most part, governments have understood

"Research is an investment in growth. Staying at the leading edge of agriculture and agri-food technology is essential if we are to remain competitive and open new markets."

Building for Success, Agriculture and Agri-Food Canada, 1995

Replacing Methyl Bromide

Methyl bromide, a broad-spectrum fumigant used in the Canadian agri-food industry to control pests and diseases in soil, facilities, and commodities, has been listed as an ozone-depleting substance under the Montreal Protocol. The planned phase-out of this chemical in Canada has left the agri-food industry searching for alternatives. One new method was tested favourably in April 1996 at the Quaker Foods Oat Mill in Peterborough, Ont. The test, a collaboration among members of the food processing and pest control industries, Agriculture and Agri-Food Canada, Health Canada, Environment Canada, and the Ontario Ministry of Environment and Energy, resulted in a 98% kill of insect eggs and 100% elimination of adult insects. The method to kill the cereal beetle pests involved a combination of heat, carbon dioxide, and magnesium phosphide Fumi-Strips®.

Test results pleased industry, who contributed $300,000 to the project, as well as environmental participants. Slightly more expensive than fumigation with methyl bromide, the test method still looks commercially viable for some food processing facilities.

this assessment and have made environmental sustainability a research priority. Advancing environmental practices that sustain agricultural production in the long term is a priority of our research program.

P. Rochette

Greenhouse gas research

Partners with the Sector

It is important that we continue to collaborate with industry to maintain our research momentum. The department's Matching Investment Initiative (*see* Box), through which we engage in jointly funded research projects with industry partners, is ideally suited to developing products and technologies useful to the agricultural sector. It is an excellent mechanism to ensure that our work is relevant to industry and responsive to environmental opportunities that could lead to new markets being secured or new cost-saving environmental innovations.

Matching Investment Initiative

Investment in agricultural and agri-food research is a proven winner. It stimulates economic activity, creates job opportunities, and strengthens the industry's competitive position in global markets. The Agri-Food R&D Matching Investment Initiative was set up to open the door for new research partnerships between industry and Agriculture and Agri-Food Canada (AAFC).

One such partnership has been formed with ITRES, a remote sensing company based in Calgary. In a joint project aimed at understanding the causes of variability in crop yield within a field so that farmers can improve the precision of their field practices, ITRES provides aircraft time and digital images of cultivated fields in Manitoba. AAFC research scientists in Ottawa analyse these images to relate crop growth to soil conditions. This technology can then be used to map the variability across a field and provide farmers with the information needed to adjust fertilizer inputs and other management practices to suit the needs in specific areas.

Under the Matching Investment Initiative, Agriculture and Agri-Food Canada will match industry's R&D contributions up to dollar for dollar. This cooperation helps to stretch industry's research funds and make sure that government research priorities reflect the sector's real needs. It also speeds up the process of transferring new technology out of the labs and into the hands of people who will put it to good use.

Affordable and Timely Technology

The technology for environmental sustainability must be affordable and developed relatively quickly. Farmers who have invested time and resources (for example, to prepare environmental farm plans), want to respond promptly to the environmental challenges identified. If the solution to these challenges is not available for a period of years or is too costly, the farmer may have no choice but a less-than-optimal response.

Affordable environmental innovations are critical to the sector's economic prospects for growth and improved farm financial performance. Agriculture and Agri-Food Canada will continue to develop and promote eco-efficient technologies, practices, and systems that sustain optimal yields.

Our Role

Research on Environmental Effects

Agriculture's environmental impacts are usually best addressed at their source on the farm. Agriculture and Agri-Food Canada intends to continue investing in research that examines farming practices and systems that have the greatest environmental effects on and off the farm. This role complements research being done by our partners in sectoral groups, provincial government, universities, and the environmental community. Research items of high priority include:

- means to reduce nutrient leaching and the resulting impacts on the quality of ground- and surface-water, as well as to limit losses to the atmosphere;

Plugging the Greenhouse Leak

Larry Labute is a greenhouse operator in Leamington, Ont., tomato capital of Canada. Concerned about Lake Erie pollution, Labute worked closely with research scientists to design a greenhouse system that prevents fertilizer and waste water from leaching into Lake Erie. "It cost more initially," says Labute, "but it's less expensive and simpler to run." The technique passes fertilizer-rich water over tomato plant roots enclosed in a thin tube made from plastic sheeting. A computer controls the constant flow of fertilizer water based on input from the grower on plant development.

Labute's three-year-old Flagship Farms greenhouse now houses 31,000 tomato plants, each producing more than 14 kilograms of tomatoes each year. The production system is a closed loop, with water and fertilizer recirculated constantly. "We use 62,000 litres of water each day. If I didn't use every drop of it, that would mean a lot of fertilizer leaching into the lake and a lot of wasted water," says Labute. As it is, his operation uses 120% less water and 75% less fertilizer than conventional operations, greatly reducing his operating costs.

Preventing water pollution while running a profitable business is Labute's goal. While not wanting to be critical of other growers, he is glad about the way he runs his business. "If the whole area used this method, there would be a lot less fertilizer run-off in the lake. The greenhouse growers in Holland had to do it. I hope we can do it voluntarily before we're forced to do it through legislation."

- reduced pesticide risk (using improved and new tools for integrated pest management, identifying alternative approaches, identifying pesticides that are more selective and less persistent and toxic, improving application methods);
- biodiversity assessment and conservation of genetic resources.

Pest Control without the Chemicals

Crop pests must be controlled if we want to avoid the millions of dollars of damage they cause each year in Canada. This opens the door for creative ways to stop pests in their tracks. Enter the Biovac, a giant vacuum cleaner being tested in Quebec to inhale pests from strawberry plants. Or the two-spotted stinkbug, a rather humble name for the insect predator that knocks the stuffing out of that voracious pest, the Colorado potato beetle. And how about the bug fence developed in B.C. that protects plants from insects that don't know enough to fly over it?

But what's really taking the bite out of crop damage by pests is the development of plants with built-in resistance. After identifying corn varieties from around the world that resist infection by *Fusarium*, Agriculture and Agri-Food Canada plant breeders have come up with a plant that stands a much better chance against this fungal infection. Through a bit of biotech wizardry, plant geneticists are now borrowing genes from other organisms and transferring them to corn and wheat in the expectation that varieties that are completely resistant to the disease will be found.

Genetic engineering is even more advanced when it comes to creating insect-resistant plants. Winnipeg researchers are working on a canola variety whose waxy leaves discourage nibbling by the ever hungry flee beetle. And plant geneticists in Ottawa have traced the insecticidal properties of one plant to a single protein. By transferring the protein-coding gene to other plant varieties, they hope to come up with insect-tolerant crops.

S. Gleddie

Colorado potato beetle

L. Reid

Fusarium-infected corn

M. McGovern

Soil research

Crop research

Areas and Systems at Risk

Specific areas of Canada's agricultural landscape under some production systems are particularly vulnerable to environmental degradation and the resulting constraints on economic growth. We intend to identify and target areas and systems at risk to ensure that farming can continue to thrive there.

Targeting areas at risk is particularly suited to problems, such as agricultural effects on water quality, that are more severe in some areas and under some types of production than others. In this way, we can ensure that scarce research dollars are spent where they are most needed. Therefore, the effectiveness of future research depends on identifying and assessing these areas and systems at risk more precisely, and then working with the sector to plan ways to tackle specific environmental problems in these areas.

Risk maps presented in the department's recent research report *The Health of Our Soils — Toward Sustainable Agriculture in Canada* show agricultural areas where natural conditions, erosion, salinization, and farming practices pose a particular threat to soil quality (*see* Map). We are currently constructing a similar risk map of southern Ontario showing areas that are vulnerable to impact on water quality resulting from agriculture. These maps will help us identify areas where environmental degradation is a particular concern.

The Health of Our Soils

In answer to the concern of farmers, the general public, and governments over the state of Canada's agricultural soils, Agriculture and Agri-Food Canada (AAFC) began in 1989 to monitor agricultural soil quality through its Soil Quality Evaluation Program. The program's goal was to develop a national capability to assess soil and associated environmental quality, as well as the effects of land use and management practices on these qualities. Armed with this knowledge, farmers, extension advisers, policy makers, and the public could then work to safeguard and preserve Canada's agricultural lands for future generations.

In 1995, AAFC published its early findings in *The Health of Our Soils — Toward Sustainable Agriculture in Canada*. Written for the non-specialist, this award-winning report defines soil health from an environmental perspective and describes it in terms of vulnerability to structural degradation, loss of organic matter, and damage by erosion and salinization. It also examines how agricultural practices affect groundwater quality.

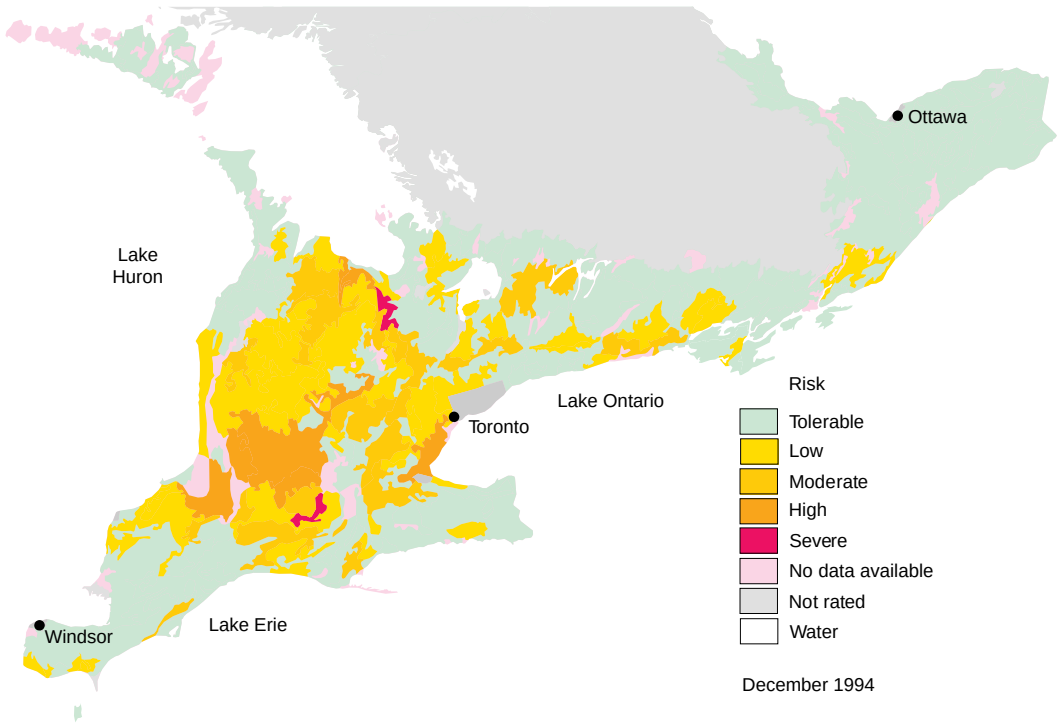
Canada is recognized as a world leader in soil quality studies. *The Health of Our Soils* continues to prove a useful tool in assisting other countries to develop plans to monitor and protect their agricultural soil health and in instructing agriculture students in the importance of soil conservation.

Development and Transfer of Technologies and Systems

Research and technology development and transfer is critical to sectoral environmental progress. The following are essential contributions of research and development to sectoral advances:

- environmentally sound management practices;
- indicators for monitoring the resource base;

The Risk of Water Erosion in Southern Ontario Under 1991 Management Practices



Source: Agriculture and Agri-Food Canada, Research Branch, Ottawa, Ont.

- pest management alternatives;
- technologies to reduce production of greenhouse gases;
- technologies to support reducing, recycling, and reusing;
- production systems that minimize crop vulnerability;
- methodologies and technologies to identify, understand, monitor, and preserve genetic resources.

Through the Green Plan Sustainable Agriculture Initiative and other programs, we have worked with provincial ministries, universities, and our other partners in technology development and transfer to provide producers with effective environmental protection tools. However, more needs to be done to equip them to respond to their potential liabilities and business opportunities, and the department must continue to research and develop new systems and

New Product Spells End for Insects

A Canadian company has put a new spin on an organic pest control method. Hedley Technologies Inc. has taken a new look at diatomaceous earth, an organic product that contains the finely ground skeletons of ancient marine plants called diatoms. When applied to insect pests that infest grain and grain elevators, this product dries out their "skin" and seeps into body cracks, resulting in death. Because no chemicals are used, there is no risk of chemical contamination.

Hedley worked with research scientists at Agriculture and Agri-Food Canada's Winnipeg Research Centre to examine the shape of diatoms and select those with the greatest pest-annoyance factors. After adding a drying agent, they found they had a diatomaceous earth that gave greater crop protection with ten times less product. Registered in Canada as Protect-It, this new product is attracting interest from all over the world.

technologies and work with its partners to transfer these to producers in an effective manner.

The Future

Research will continue to be aimed at the public good, with funds targeted at high-priority needs. In particular, the department will build on its current capacity by placing increased emphasis on areas at risk and the impacts of agriculture on water quality. Research partnerships with industry will be sought to make research dollars go farther and to ensure that industry needs for new technology are being met. Industry has assumed a larger role in helping to develop innovations and in advising farmers on new agricultural developments. It has done this because it often makes good business sense to bridge the gap, and because it is becoming more aware of agri-environmental challenges and more willing to assume responsibility to find good solutions to these challenges. Industry's role in technology transfer is expected to expand in the future. It will be through these partnerships that innovations and solutions will best be developed and transferred to the sector.

ACTION PLAN 3 — DEVELOPING INNOVATIONS AND SOLUTIONS

Priority 1

Through research and development, increase the availability to industry of commercially viable systems and technologies to address on- and off-farm environmental effects of agricultural activities.

Actions

Ongoing

1. Continue to collaborate with provinces, universities, and industry to improve water quality and the efficiency of water use through the development of better crop- and livestock-management practices that:

- reduce nitrogen and phosphorous levels in manure (e.g., through research into ration formulation, nutrient balance, and availability);
- stabilize and add value to animal manure;
- take into account crop rotations, better use of forages, innovative cultivation strategies, and fertilization needs;
- reduce the salinization of agricultural soils;
- utilize well planned and developed effluent management systems (e.g., constructed wetland systems for handling effluent from livestock operations).

Ongoing

2. Continue to collaborate with provinces, universities, and industry to undertake the development, and encourage the transfer, of innovative, affordable technologies that contribute to:

- more precise control of nutrients (fertilizers and manure) to match crop requirements;
- improving irrigation efficiency;
- reducing fertilizer and pesticide leaching and bacterial losses to the environment;
- improving manure storage and handling techniques, such as by using anaerobic and aerobic methods;
- improving food processing, preservation, and storage to reduce product loss;
- improving methods and procedures to treat food wastes.

Ongoing

3. Continue to develop new crop varieties that promote biodiversity and provide environmental benefits, such as crops that enhance genetic resistance to disease or carbon sequestration in soils, or that utilize nutrients or other inputs more efficiently.

Ongoing

4. Continue to develop new strategies for integrated pest management that combine biological, chemical, and mechanical methods by:

- developing decision support systems to assist growers in making decisions about pest control;
- developing biological agents for the control of insects, weeds, and diseases.

Ongoing

5. Pursue partnerships with industry to conduct research related to improving ethanol production processes, including feedstock production.

Ongoing

6. Continue research on the contribution of agriculture to greenhouse gas emissions and reductions through:

- analysis of fundamental greenhouse gas processes (nitrogen and carbon–nitrogen cycles);
- analysis of carbon sequestration potential of soils.

Priority 2

Identify areas at most environmental risk.

Actions

Ongoing

1. Provide information and interpretations on the location, quantity, and quality of land and water resources for agriculture by:

- improving the digital database of Canadian soils;
- developing GIS capabilities and providing support in the analysis of environmental risk;
- improving the system of rating soil suitability for specific crops;
- incorporating into the national database relevant new information (e.g., biodiversity) and information derived from interpretations (e.g., water quality).

Ongoing

2. Determine the yield capability and the vulnerability to contamination of specific prairie water resource systems (e.g., aquifer studies, hydrological basin studies).

Ongoing

3. Incorporate long-term drought mitigation measures and participate in the development and maintenance of a drought-reporting network that would provide information on drought conditions and risks to agriculture in the prairie region.

Ongoing

4. Provide farmers, policy makers, and agri-business with information to assess the most appropriate use of land and water resources by:

- identifying opportunities and constraints posed by land and water use to regional, commodity-specific, and other economic initiatives;
- providing information and technical support to overcome land and water constraints to development.

Strategic Direction 4

Seizing Market Opportunities

A large majority (75%) of agricultural experts from around the world believe that a country's food products would be more competitive on the international market if the country moves quickly toward sustainable agriculture

GlobeScan, Special Report on Forestry and Agriculture Issues, February 1996

STRATEGIC DIRECTION

Encourage agriculture and agri-food marketing and trade that promote environmental quality and sustainable growth.

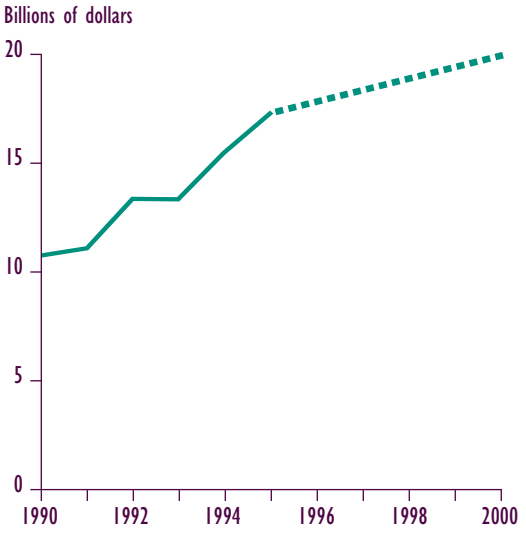
PRIORITIES

Increase industry awareness of environmental marketing and trade opportunities and constraints, enabling proactive responses.

Facilitate the demonstration of the environmental quality of products, practices, and services provided by the agriculture and agri-food sector.

Influence domestic and international initiatives in the interests of environmental progress and the Canadian agriculture and agri-food sector.

Value of Canada's Agri-food Exports



Note: Dashed line denotes forecasting.

Source: Agriculture and Agri-Food Canada. Economic and Policy Analysis Directorate. Ottawa, Ont.

The Need for Vital Agri-food Industries

Expanding Canadian agri-food trade will involve helping Canadian companies become export-ready, enhancing trade performance, disseminating market information and intelligence, and improving market access. These activities support the industry in attaining its goal to increase the value of Canada's exports of agri-food products to $20 billion by 2000. At the same time, industries can maximize the benefits from the $80-billion domestic agri-food market by encouraging diversification of markets served and products offered.

Ultimately, Canada's goal is to recapture a 3.5% share of the world's trade in agri-food products, last held in the early 1960s. There are numerous opportunities to capitalize on Canada's expertise in food production and its good reputation abroad to build new export business. The strategic direction for *Seizing Market Opportunities* seeks to minimize environmental barriers to trade and to alert agri-food industries to new market opportunities related to good environmental management.

Environmental Integration

Given the globalization of world trade and the increasingly international dimension of environmental issues, the integration of economic and environmental factors is rapidly becoming a factor in business decision making, and this influence is expected to increase. Trade liberalization and globalization have already begun to change the Canadian agri-food industry, causing it to adjust from being largely domestically focussed to being internationally competitive and more proactive in developing its export market. This strategic direction recognizes that environmental quality and sustainable growth are key to agri-food marketing and trade.

Environmental Marketing

Environmental marketing involves challenges and opportunities that arise from trying to capture new markets while working toward greater environmental sustainability. The Canadian public remains committed to environmental protection, and growing numbers of consumers are factoring environmental considerations into their purchasing decisions. In Canada we are in a relatively strong position with respect to the health of our environment, and this represents a market opportunity for the agri-food sector. "Green consumerism" is a trend in which consumers favour environmentally friendly products with characteristics such as being phosphate-free, CFC-free, non-toxic, and biodegradable. The preference of many of Canada's major trading partners for "green" products affects the marketing of certain export commodities. One way to capitalize on such market opportunities is by demonstrating sound environmental practices in a transparent manner.

Ecolabelling may be one way to demonstrate that transparency, providing an opportunity to gain market advantage based on consumers' preference for a "green" product. One example of that approach is the Environmental Choice Program, which was created to help consumers identify products that are less burdensome to the environment throughout their life cycle by allowing such products to carry the EcoLogo. While there are currently no food products in the program,

Strawberries to Stratosphere

Injected into strawberry fields prior to planting, methyl bromide protects new plants against weeds, disease, and nematodes, a soil-borne pest. So when the United Nations Montreal Protocol declared methyl bromide an ozone-depleting substance, Charles Keddy was dismayed. He needs to protect the 12 million strawberry plants growing on 75 acres of his mixed farm in Nova Scotia, an important supplier of hardy seedlings to commercial growers in Florida, Georgia, Alabama, and several northern U.S. states.

"Methyl bromide very effectively controls pests and weeds," says Keddy, "but it also very effectively harms the ozone layer in the stratosphere." The use of methyl bromide will be phased out in Canada by 2001, creating a difficult situation for farmers and nursery operators who need to find effective alternatives quickly. Keddy didn't wait for help from the government or chemical companies, instead launching his own research project. "I'm running tests on 12 different fields with combinations of approved chemicals. I hope I can find one treatment that will control weeds and diseases," says Keddy.

Agriculture and Agri-Food Canada's Kentville Research Station is helping him with soil sampling and analysis, and he's hoping the chemical companies will shoulder some of the research costs. Meanwhile, Keddy puts his environmental concern into practice using integrated pest management in other farm operations. "Two years ago we stopped regular spraying of our crops for pests and disease control," says Keddy. Now they scout the fields every few days and use chemicals only when they see signs of a problem.

it does apply to non-food agricultural products such as particle board made from agricultural fibre (straw). The development of an organic certification and accreditation system based on national standards is another example of that approach. Certified organic agriculture, which complies with standards for crop and livestock production, is recognized as one of a variety of production methodologies that promote sustainable agricultural development.

Industrial Uses

Industrial uses of agricultural products offer the potential for economic as well as environmental benefits by decreasing reliance on non-renewable resources. For example, biodegradable plastics, bio-fuels (e.g., fuel ethanol), and oat-based cosmetics can replace products derived from non-renewable resources. Capturing by-products from agriculture and food processing industries can reduce the volume in the waste stream, expose the industry to new marketing and revenue-generating opportunities, and reduce the costs of producing the main product, all of which improve the competitive position.

Environmental Industries

The environment industry is one of the fastest growing sectors of the economy, comprising diverse technologies, processes, products, and services that deal with monitoring and assessing pollutants, preventing and controlling pollution, and clean-up and restoration. In Western Canada alone the industry is expected to grow annually by 5 to 15% during 1993 to 1998, and currently involves an estimated 2,000 environmental businesses that generate $1.4 to $1.8 billion in revenues annually and employ almost 20,000 workers.

Conservation Tillage Restores the Soil

As more and more farmers turn to conservation tillage systems to protect their soil from erosion, a young Saskatchewan company is moving in to provide the right equipment. Conserva Pak Seeding Systems, the brainchild of grain and oilseed farmer Jim Halford, manufactures a zero-till seed drill that places seed and the crop's fertilizer needs for the whole season in one pass of the field. With production expanding each year and orders coming in from as far away as Australia, business is booming. What's the secret? "Zero-till restores the soil, bringing it as close to natural conditions as possible," says Halford. "Our equipment makes zero-till seeding and fertilizer placement more accurate and efficient, and that makes sense to farmers."

This thriving business had humble beginnings, down on the Halford farm near Indian Head, Sask. "We live in a valley and we had two erosion problems — wind and water. The soil was getting worse and we had to do something about it," says Halford. In 1979 he started using zero-till, a system that eliminates tillage completely, cutting at least by half the number of times equipment is on the field and keeping soil disturbance to a minimum. Dissatisfaction with an early-model seed drill led Halford to build his own seeding equipment. It worked so well, he knew others would buy it.

Now patented in three countries and commercially marketed since 1989, Halford's seed drill is under growing production. "We've had to expand our production facilities every year for the past five years and we employ 25 people full time, up from 15 last year. And we've still got room to grow," says Halford. He's proud to make a product with environmental benefits that he's seen first hand. "After 18 years of zero-till on our farm, organic matter has returned to native levels, water infiltration is better, there are more nutrients, and we've stopped the erosion," says Halford. "That's a big improvement."

The use of environmentally sustainable technologies in agriculture and agri-food industries could lead to the development of new types of commercially viable equipment, supporting new service industries, particularly in rural areas. For example, the adoption of conservation tillage practices can stimulate growth and innovation in the production of low-tillage machinery.

Environment and Trade Issues

Canada is a signatory to global and regional trade agreements that promote trade liberalization. The government has also ratified a number of international environmental agreements that are intended to protect the environment and promote sustainable development. The challenge is to actively participate in shaping these agreements to benefit the sector.

Industrial uses of agricultural products.

Trade Liberalization and Sustainable Development

Domestic agricultural policies and programs can augment or offset the generally positive environmental effects of trade liberalization. Producers will base production decisions on the most profitable use of their resources. Commodity-specific support programs that distort trade and enhance production tend to encourage more intensive use of inputs. The use of direct, decoupled payments to producers for environmental purposes does not distort trade, but promotes appropriate land use and resource stewardship.

International Trade Rules and the Environment

Increasingly, global environmental issues are being addressed through multilateral forums, using such instruments as protocols, conventions, and agreements. A variety of instruments and measures have been adopted to achieve specific environmental objectives.

Of about 180 international environmental agreements, only 17 include trade measures as an instrument to achieve specific environmental objectives. Canada is a signatory to two international environmental agreements of particular relevance to agricultural and agri-food trade, the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) and the Convention on Biological Diversity (1992).

The WTO Agreement permits, with certain constraints, the use of trade measures "necessary to protect human, animal or plant life or health" (Article XX b) or to conserve "exhaustible natural resources if such trade measures are made effective with restrictions on domestic production or consumption" (Article XX g). Use of these measures must be non-discriminatory between WTO members where similar conditions prevail, and must not constitute a disguised restriction on trade.

Some countries consider current rules adequate to provide the desired level of environmental protection. Other countries, including Canada, consider that there is a need to clarify international trade rules related to measures in support of environmental objectives, and work on this issue will continue in the WTO.

Standards, Ecolabelling, and Prior Informed Consent

International pressure for tougher, universal environmental standards is mounting, mainly because of growing concern for the effects of human activity on the environment. Many businesses have responded by developing environmental management systems to gain certification through the International Standards Organization (ISO). Participation in the ISO 14000 series of environmental management standards is voluntary, but certification is seen to enhance international competitiveness (*see* Box). Many countries are now considering implementing ISO certification as a requirement for doing business within their borders.

Ecolabelling schemes may be one way to demonstrate environmental responsibility, but there are concerns about possible unfair burdens, high competitive costs on foreign producers of like products, and the wide variation of criteria and procedures that could be contained in these schemes. These programs could restrict the access of Canadian producers to foreign markets, especially in countries where labelling schemes impose strict criteria and mechanisms for certification.

ISO 14000 — Environmental Management

Organizations in today's world are under growing pressure to operate in an environmentally sound way. Increasingly stringent environmental legislation, the development of economic policies and other measures to protect the environment, and public concern about environmental issues all contribute to this pressure. As a result, organizations of all kinds are becoming more concerned about how to control the impact of their activities, products, and services on the environment.

ISO 14000 is a series of standards being developed by the International Organization for Standardization to help such organizations manage their environmental impacts. The series provides standards in six areas:

- environmental management system;
- environmental auditing;
- environmental performance evaluation;
- environmental labelling;
- life cycle assessment;
- environmental aspects in product standards.

These standards are intended to make it easier to integrate environmental management into the overall management plan of an organization, assisting it to meet both its environmental and economic goals. More information on ISO 14000 can be obtained from the Standards Council of Canada.

The Prior Informed Consent (PIC) Procedure is a voluntary process for formally obtaining and giving notice of the decisions of importing countries as to whether they wish to receive shipments of specified chemicals. The aim is to promote a shared responsibility between exporting and importing countries in protecting human health and the environment from the harmful effects of the international trade of certain hazardous chemicals.

Canada is currently participating in negotiations to make the PIC Procedure a legally binding instrument. Canada is also participating in negotiations for an International Biosafety Protocol for the transboundary movement of living modified organisms. Within this protocol, a new procedure called Advance Informed Agreement will be developed to identify the responsibilities of exporters and importers of such organisms.

Our Role

Domestically, the government has a role to play in undertaking market intelligence so that the sector can capitalize on environmental marketing opportunities. In relation to trade in primary commodities and food products, the role of the department is to work with the Department of Foreign Affairs and International Trade and other interested departments to maintain and increase foreign market access for agricultural and agri-food products, to improve international trade rules, and to ensure that other countries also apply those rules. Environmental considerations are one set of factors that need to be considered in working to achieve these goals.

There are many ways that Agriculture and Agri-Food Canada can work with others in the sector and in government, including:

- monitoring international as well as domestic environmental trends and providing this information to industry to enable it to make decisions with the best available information;
- finding new ways to demonstrate transparently and credibly that farm and processing practices can be environmentally responsible;
- monitoring the use of environmental subsidies in other countries, including potential implications for competitiveness;

New Code of Practice

The Canadian Pork Council has developed a new code of practice for environmentally sound hog production in Canada. Putting the code together was a lesson in good partnership, with input from the National Agriculture Environment Committee, Agriculture and Agri-Food Canada, Environment Canada, provincial governments, universities, and lending institutions.

Following the new code is strictly voluntary and compliance with federal and provincial regulations for the hog industry is still required. The code aims to:

- assure domestic and foreign consumers that Canadian hog production follows environmentally sound management practices;
- provide provincial and local governments with a basis for developing regulations for hog production;
- offer environmentally sound management options to Canadian hog producers;
- outline a strategy to maintain a favourable resource base for hog production in Canada while meeting broader social concerns for the environment.

- ensuring that the development and implementation of environmental laws, regulations, and policies are transparent and do not present unfair barriers to trade;
- ensuring that the sector's interests help shape national and international environment–trade initiatives.

The Future

Environmental considerations may become more important in trade negotiations and the opening of future market opportunities. Canada's generally strong environmental position has already made us competitive in the world marketplace, but more attention to environmental sustainability is needed in the agriculture and agri-food sector to place it in the fore of competition and make its products desirable to demanding consumers. The agriculture and agri-food sector will be better prepared to meet the challenges and to benefit from both market forces and trade liberalization if it understands how markets and international trade agreements relate to the environment. Agriculture and Agri-Food Canada will work closely with its partners within the federal and provincial governments, sectoral agencies, and consumer and environment groups to help achieve that understanding.

ACTION PLAN 4 — SEIZING MARKET OPPORTUNITIES

Priority 1

Increase industry awareness of environmental marketing and trade opportunities and constraints, enabling proactive responses.

Actions

Ongoing

1. Facilitate the diversification and marketing of environmentally beneficial crops by:

- supporting sectoral or commodity-specific groups wishing to develop and market new, environmentally sustainable crops;
- promoting, developing, and disseminating information on market opportunities related to value-added, environmentally sustainable, alternative prairie crops.

1997–98

2. Develop an environmental module to be included in AgriFITT, a training tool designed to identify and pursue market opportunities.

Ongoing

3. Work with industry to address the environmental constraints to value-added processing in prairie agriculture by providing technical support on land and water issues.

Priority 2

Facilitate the demonstration of the environmental quality of products, practices, and services provided by the agriculture and agri-food sector.

Actions

1997–98

1. Promote the potential of individuals/organizations within the agriculture and agri-food sector that offer environmental products, practices, or services ("environmental industries") to stimulate rural economic growth.

Ongoing

2. Include in marketing strategies and messages, as appropriate, the environmental benefits of agricultural products for industrial use.

1997–98

3. Determine methods of demonstrating and capitalizing on the environmental attributes of Canadian agri-food products in market development.

1997–98

4. Promote the marketing of environmentally sound transgenic grains and oilseeds.

1997–98

5. Work with the industry to facilitate the development of an internationally acceptable national organic certification and accreditation system.

Priority 3

Influence domestic and international initiatives in the interests of environmental progress and the Canadian agriculture and agri-food sector.

Actions

1997–98

1. Analyse linkages between trade liberalization and agricultural policy reform, and how these linkages affect environmental sustainability in Canadian agriculture.

Ongoing

2. Work with the Commission for Environmental Cooperation on studies of the agri-environmental effects of NAFTA.

1997–98

3. Work with the OECD to improve understanding of the environmental impacts of agricultural policy reform.

Ongoing

4. Work with the Department of Foreign Affairs and International Trade and other interested departments to promote the development of international trade rules that encourage greater environmental sensitivity consistent with Canadian agriculture and agri-food trade by:

- developing Canadian positions for environmental aspects of international trade discussions and for trade aspects of environmental discussions in relation to Canadian agriculture and agri-food interests;
- defending Canadian agricultural and agri-food trade interests in bilateral or international disputes arising from environmentally related trade measures;
- providing information to Canadian stakeholders on the state of international discussions on trade rules or measures related to environmental issues, and consulting on potential Canadian positions in these areas.

Conclusion

Agriculture in Harmony with Nature describes the manner in which Agriculture and Agri-Food Canada will work with its partners in the sector, in other federal and provincial agencies, and in the academic and environment communities as well as with other Canadians to further advance environmental sustainability in Canadian agriculture and agri-food.

The emphasis in this strategy is on the environmental component of sustainable agriculture and agri-food development. By defining more precisely the department's environmental priorities for providing information, tools, and technologies to its clients, environmental elements will be as well defined as the social and economic components of the department's sustainable development activities.

Achieving progress in environmental sustainability is a process of continuous improvement. Additional time-bound, measurable performance indicators will be developed during implementation to allow Canadians and the Commissioner of Environment and Sustainable Development to monitor the effectiveness with which these initiatives are undertaken. When the strategy is updated in three years, Agriculture and Agri-Food Canada will have a firm base to build on and will be in a stronger position to address even more effectively the environmental, social, and economic challenges of sustainable development.

Glossary

Adaptation: The process by which the industry adapts to changes, such as changing markets and new technologies, policies (including environmental policies, programs, and priorities), and international trade agreements.

Agricultural inputs (*also* **Farm inputs**): Commodities such as fertilizer, agrichemicals, and energy that are used in farm production.

Agriculture and agri-food sector: That sector of the economy that involves farming, food processing, and food distribution.

Agroecosystem: An ecosystem under agricultural management; an open, dynamic system connected to other ecosystems through the transfer of energy and materials.

Agri-environmental indicator: A measure of change either in the state of environmental resources used or affected by agriculture, or in farming activities that affect the state of these resources.

Alternative livestock farming (*also* **Game farming**): Husbandry of non-traditional animals, such as cervids (e.g., deer, elk), emu, and ostriches.

Areas at risk: Areas that are particularly vulnerable to environmental degradation resulting from agriculture.

Best management practice: A farming or food production practice most likely to support environmental sustainability.

Biological diversity (*also* **Biodiversity**): The variety in living organisms and their interrelationships, including genetic, species, and ecosystem biodiversity.

Biotechnology: Any technological application that uses biological systems, living organisms, or their derivatives, to make or modify products or processes for specific use.

Carbon sequestration: Increasing the amount of carbon stored in the soil, usually by using a management practice that builds organic matter; this process helps to slow the trend toward increasing concentrations of carbon dioxide in the atmosphere.

Commissioner of the Environment and Sustainable Development: A position established by amendment to the *Auditor General Act* to audit the implementation of the government's sustainable development policies and practices.

Conservation tillage: Methods of tillage that maintain a cover of crop residues on the soil surface and either reduce the amount of tilling (reduced or minimal tillage) or eliminate it altogether (no-till).

Diversification: Encouraging greater variety of farming processes and products to buffer against economic change and market uncertainty.

Eco-efficiency: A strategy adopted by business and government to promote the ecological and economic benefits resulting from more efficient use of energy, water, and materials.

Ecolabelling: The use of labels to inform consumers that a product has been determined by a third party to be more environmentally friendly than other products in the same category.

Ecosystem: A dynamic complex of organisms, including humans, and their physical environment, interacting as a functional unit.

Environment industry: Comprising diverse technologies, processes, products, and services that deal with monitoring and assessment of pollutants, preventing and controlling pollution, and clean-up and restoration.

Environmental management system: A system providing a framework to monitor and report on an organization's environmental performance.

Environmental risk: The risk that there will be an immediate or long-term harmful effect on the environment.

Environmental sustainability: Using environmental resources in a manner that maintains their potential to meet the needs of present and future generations.

Farm management strategy: An overall plan for operating a farm that includes decisions about cropping, tillage, and inputs, factoring in environmental and economic considerations.

Green consumerism: A preference of consumers for products that have been produced using environmentally friendly processes, or that themselves are environmentally friendly.

Integrated pest management (IPM): Control of pests using a combination of crop rotations, cultivation, and biological and chemical pest controls.

Intergenerational equity: A fair distribution of the costs and benefits of development between generations.

Life cycle assessment: A tool for identifying the environmental releases of a product, process, or activity, and evaluating the associated impact.

Living modified organism: A plant, animal, or microbe whose genetic material has been changed to make the organism more useful to humans.

Multiple-use benefits: An approach to the management of land and its associated resources that strives for a balance among a variety of needs, such the use of a land area for agricultural, habitat, and recreational purposes in a manner that preserves the quality of the resource for each use.

NO_x/VOCs: Nitrogen oxides and volatile organic compounds; greenhouse gases released from the soil.

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water.

Safety net programming: Programs designed to protect against economic losses resulting from natural hazards, poor market conditions, or both; income stabilization and crop insurance programs.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Trade liberalization: The improvement in market access among trading nations resulting from reduced use or elimination of protectionist and trade-distorting measures, including tariffs, import quotas, export subsidies, and domestic production and transportation subsidies.

Value added: The increase in the market price of a commodity resulting from each stage in its production. In the case of agricultural products, value is added to farm output through processing activities. Value added also has a broader meaning when it reflects the increase in quality or availability of a public good (e.g., clean water, air) resulting from specific activities.

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Appendix 1

Profile of Agriculture and Agri-Food Canada

Our Mandate

Agriculture and Agri-Food Canada promotes the development, adaptation, and competitiveness of the agriculture and agri-food sector. Through national policies, programs, and services, we help the sector maximize its contribution to Canada's economic and environmental objectives and ensure a dependable supply of safe, nutritious food at reasonable prices to consumers, with equitable returns to producers and processors. We also participate in developing and implementing federal policies and programs for socio-economic development, emergency response, and international relations.

Working in Partnership

The federal and provincial governments share agricultural jurisdiction in Canada. Natural and non-renewable resources are among the areas of exclusive provincial powers, along with property and civil rights, local matters and undertakings, and education. Although there is no mention of environment in the Canadian Constitution, federal responsibility for the environment has been established through federal legislation and by specific court decisions. The federal government also responds to international and interprovincial issues requiring action at the national level.

Over the years we have developed a series of mechanisms to work with provincial partners in designing important agri-environmental initiatives. The economic and regional development agreements, soil conservation initiatives, federal–provincial accords on soil and water conservation, the National Soil Conservation Program, and the Green Plan Sustainable Agriculture Initiative illustrate federal–provincial partnerships to promote environmentally sustainable practices in the sector.

Mechanisms have also been developed to work with industry, consumer groups, and environmental organizations. The regional environmental sustainability accord committees in each province heed industry advice on priority setting, project selection, and implementation. Typically, consumer and environmental community representatives also sit on the accord committees or advise on its decisions.

We work regularly with other federal departments, including Environment Canada, Health Canada, the Department of Foreign Affairs and International Trade, Industry Canada, Natural Resources Canada, the Department of Fisheries and Oceans, the Department of Finance, and Revenue Canada. For example, we recently cooperated with Environment Canada to establish and fund a National Agriculture Environment Committee, composed of national farm leaders, to develop strategies to address environmental issues facing the farming community.

Branch Activities

Environmental sustainability has long been at the core of the department's activities. We continually work at integrating this concept into our departmental activities, a description of which follows.

Research Branch

The Research Branch undertakes agricultural research and development to contribute to the ongoing competitiveness of a diversified and environmentally sustainable agriculture and agri-food sector in Canada (including non-food uses of agri-food products) by developing and transferring innovative technologies. Environmental sustainability was a key factor in the creation of the first experimental farms in the 1880s and has been a major consideration during the subsequent creation and reorganizations of the Research Branch.

Environmental research and development objectives are integrated into each of the branch's four areas of business. *Resource conservation research* includes soil, air, and water management; conservation and protection; germplasm conservation; greenhouse gas control; and residue recycling. *Crop research* includes breeding for resistance to diseases; disease identification; biological pest control; and integrated pest management. *Animal research* examines nutrition and breeding; waste and manure disposal; and animal welfare. *Food and non-food research* studies ways to increase the safety and quality of agri-food products, and to enhance crop utilization as food and non-food products. Such activities are supported on an ongoing basis from the core budget.

Research and development activities that promote sustainable agriculture include:

- involvement in targeted programs, such as the National Soil Conservation Program, the Soil and Water Environment Enhancement Program, and the Great Lakes Water Quality Program;
- research under the Green Plan Sustainable Agriculture Initiative on topics such as climate change, greenhouse gases, genetic resources, and ethanol production;
- application of biotechnology to introduce value-added characteristics and to foster sustainable farming practices;
- application of information technologies to enhance the ability to monitor and preserve the quality of soil, water, and air;
- communication of knowledge to clients;
- collaboration with industry partners through programs such as the Matching Investment Initiative to accelerate the transfer of emerging technologies.

Food Production and Inspection Branch

The Food Production and Inspection Branch enhances the marketability of agricultural and food products by eliminating or controlling plant and animal diseases and by facilitating compliance with standards of agri-food safety, quality, composition, and labelling. It also sets and enforces standards to safeguard animal and plant health, preventing the spread of major pests and diseases while facilitating national and international trade.

Environmental concerns have been part of the branch's lines of business for many years and are increasingly considered as new policies and procedures are developed to address traditional program goals. At the time of writing (February 1997) the Food Production and Inspection Branch is preparing to transfer its mandate and operations to the new Canadian Food Inspection Agency. The Agency will continue to perform important functions related to environmental sustainability. Examples of environmentally related activities include:

- conducting environmental assessments of proposed amendments to agricultural legislation, fumigation of storage facilities, licensing of animal vaccines, and importation of exotic animal species;
- assessing the risk of living modified organisms for use as animal vaccines;

- leading and coordinating departmental and sectoral activities relating to international negotiations on a biosafety protocol for the transboundary movement of living modified organisms;
- enhancing Agriculture and Agri-Food Canada's ability to conduct human health and environmental safety assessments of fertilizers and fertilizer supplements and to facilitate the introduction of environmentally sound products;
- carrying out the environmental assessment of agricultural products of biotechnology under the terms of the *Seeds, Feeds, Fertilizers*, and *Health of Animals* acts, consistent with the principles of the federal framework for regulating products of biotechnology.

Policy Branch

The Policy Branch develops, delivers, and analyses policies and programs that provide long-term income stability to agricultural producers and improve the ability of the agriculture and agri-food sector to compete and adapt to change. Priorities include the continuing reform of safety net programming, supply management, transportation and grain policy, and adaptation, to improve the sector's ability to diversify and capture markets. Through the Rural Secretariat, the branch also works toward the broader goal of ensuring the sustainability of rural areas. Environmental considerations are factored into how each of these priorities is addressed.

The branch works toward agricultural sustainability by:

- developing adaptation policies and programs that enhance the sector's sustainability, as well as its competitiveness;
- carrying out environmental reviews of policies and programs;
- developing an integrated economic–environmental modelling system to support policy analysis;
- developing agri-environmental indicators;
- coordinating Agriculture and Agri-Food Canada's involvement in government-wide environmental policy initiatives;
- participating in the development of international environmental agreements (e.g., the Montreal Protocol on Ozone Depleting Substances, the Canadian Biodiversity Strategy, and the Framework Convention on Climate Change) by developing, articulating, negotiating, and reporting on Canadian positions to ensure that the agreements achieve environmental progress while not unduly impairing the long-term market access of the Canadian agri-food sector.

Market and Industry Services Branch

The Market and Industry Services Branch supports programs and services that assist the sector to enhance its domestic and international market share. Its priorities include increasing and securing market access; maximizing trade opportunities; increasing the capacity of the Canadian agri-food industry to supply Canadian product to the domestic and world markets (with a strong emphasis on delivering to clients market intelligence and information); and working toward an enhanced investment climate that will make Canada's agri-food industry a preferred focus of domestic and foreign investors. Environmental issues are a part of the intelligence and information that are tracked.

Market and Industry Services Branch has played and continues to play a role in the development of sustainable agriculture by:

- identifying opportunities that arise from the emphasis on environmental issues in international trade agreements;
- ensuring that decisions taken internationally (e.g., through international trade and environmental agreements) reflect the interests of the agri-food industry;
- enhancing the sector's ability to capitalize on market opportunities;

- tracking environmental regulatory requirements that may present both opportunities and barriers to the Canadian agri-food industry;
- providing information to assist the food processing, distribution, and retail food service sectors in meeting consumer demands while maintaining competitiveness;
- tracking consumer attitudes and buying habits with respect to environmental products;
- implementing farm-level sustainable agriculture initiatives (e.g., Land Management Assistance Program, Green Plan Sustainable Agriculture Initiative).

Prairie Farm Rehabilitation Administration

The Prairie Farm Rehabilitation Administration (PFRA) was established under the *Prairie Farm Rehabilitation Act* in 1935 to rehabilitate prairie farm land affected by drought and soil drifting. PFRA has continued to promote sustainable development on the rural prairies since then, recognizing the link between protecting environmental resources and reducing risks to economic security.

PFRA deals directly with prairie people, offering technical information and regional leadership to help them improve the quality of their lives. The branch delivers services through a network of field locations in the Prairies, and its western presence and experience with client service and program delivery are an integral component in fulfilling the federal government's vision for the sector. It has made and continues to make important contributions to sustainable development by involvement in various programs and activities that address:

- soil degradation and resource protection (through Economic and Regional Development Agreements, the National Soil Conservation Program, the Permanent Cover Program, and the Green Plan Sustainable Agriculture Initiative);
- rural water supplies and efficiency of water use (through the Rural Water Development Program, the Manitoba Crop Diversification Centre, and the Saskatchewan Irrigation Development Centre);
- wildlife habitat and biodiversity (through the PFRA Community Pasture Program and the Shelterbelt Centre).

Corporate Services Branch

The Corporate Services Branch provides management and administration services to departmental managers in managing their human, financial, and physical resources. In recent years environmental considerations have become more important in this activity as governments strive to "lead by example" in the areas of procurement, fleet management, engineering services, and real property pertaining to the physical operations of the department.

Examples of recent environmental activities include:

- leading the formulation of the department's environmental management system;
- development of a screening procedure, manual, and training program for real property managers to assist the department in conducting environmental assessments of construction projects and real property transactions;
- creation of a database for above- and under-ground storage tanks owned and operated by the department;
- completion of environmental assessments on all of its waste sites;
- development of an action plan for CFC phase-out, including modification or replacement of equipment to allow for the use of acceptable refrigerants;
- proper disposal or storage of PCBs;
- development of an action plan to reduce fleet size and improve the efficiency and environmental practices of vehicle operations.

Communications Branch

The Communications Branch provides communications advice, public environment analysis, information, and operational services. Professional advice and counsel are provided to the Minister, senior management, and other departmental officials to ensure the effective integration of the communications component into policy development and design. The aim is to maintain effective and constructive two-way communication between the department and its clients on issues that affect the agri-food sector, including environmental issues, through activities such as:

- providing expertise and support to the Environmental Management Services Task Force;
- managing the communication plan and media relations for environmental issues (e.g., methyl bromide, alien organisms, biodiversity);
- sponsoring the Agri-Food Awareness Program to provide information on a broad range of issues to the public.

Human Resources

The Human Resources Branch is responsible for training and recruitment in the department. Working toward sustainable development in the government requires a mixture of disciplines, and this branch ensures that the right expertise is developed and acquired.

Instruments for change

As agriculture continues to integrate into the wider economy, both domestically and internationally, the role of government is shifting from support programming to providing the appropriate framework for industry to compete effectively in the marketplace while ensuring that the public interest is protected. In the past, the government used direct expenditure (e.g., environmental program funding, financial incentives) to encourage the sector to adopt more environmentally sustainable practices. Given the current climate of fiscal restraint, the government is shifting toward voluntary approaches and other policy and economic instruments.

Voluntary Approaches

Voluntary approaches call for individuals, groups, communities, and industry at large to voluntarily undertake action to accomplish specific objectives. But not every group is willing, or able, to take on the self-monitoring and reporting associated with this approach. Voluntary approaches also carry obligations of transparency and public accountability that can be costly to producers and raise concerns of confidentiality for some participants. Agriculture and Agri-Food Canada will continue to support producer groups in carrying out self-regulation and other forms of voluntary actions.

Education and Awareness

Better awareness and education play a key role in moving the sector toward more environmentally sustainable agriculture. They also help to shape public perceptions of the environmental performance of the agriculture and agri-food sector and to equip all Canadians to integrate social, economic, and environmental considerations into their decision making.

Most of our environmental programming, such as the Green Plan Sustainable Agriculture Initiative, has included education and awareness activities that we have supported by publishing studies and discussion papers, and by developing promotional materials, displays, and presentations that encourage stewardship. These efforts work best with youth, Canada's farmers of tomorrow, and with individuals who are "early adopters" or already sensitive to environmental issues. For this reason, education and awareness are tools that work well along with other instruments of change.

Economic Instruments

Economic instruments offer a way of harnessing market forces to achieve environmental objectives in a cost-efficient, flexible manner. They encourage quick and innovative responses by producers who select the least costly method of achieving an objective. The government may also save money, because the administrative burden is often less with economic instruments than under a regulatory regime. Examples of economic instruments include:

- valuation of benefits, such as encouraging the conservation of wildlife habitat by allowing farmers to charge for access to farm land;
- tradeable permit systems, such as the one chosen by the sector to meet Canada's international commitments on ozone depletion and reductions in the consumption of the fumigant methyl bromide;
- emission-based charges, such as those applied to effluent from dairies to abate pollution.

Research and Technology Transfer

Through our Research Branch, we work with our provincial and industry partners to solve environmental problems and accelerate the adoption of environmental technology by:

- transferring the results of long-term environmental research to industry researchers, extension specialists, equipment manufacturers, and innovative producers;
- initiating collaborative environmental research projects that are beneficial to the sector;
- maintaining valuable and unbiased evaluative resources.

We can promote the adoption of better environmental practices and innovations through approaches that feature risk sharing, farm-level support, technology support, information services, and assessments of the effectiveness of technology. Mechanisms such as the Matching Investment Initiative can be used to allocate research resources to industry concerns.

Legislation and Regulation

Statutes and their regulations place legal conditions on specific activities and require the sector to meet certain standards. They are particularly useful to protect health, safety, and the environment when there is little allowance for risk and action is needed immediately and in the long term.

Growing public concern about the effects of pollution on human health and the potential environmental impact of agricultural products of biotechnology, mounting international pressure for tougher environmental standards, and tighter fiscal restraint have increased the pressure on public policy makers to maintain strict environmental standards. Our task is to devise a flexible legislative framework that allows stakeholder involvement by, for example, participating in the development and implementation of standards, while the government audits industry performance. Agriculture and Agri-Food Canada also plays an important role in the development of regulations by other departments, such as Health Canada and Environment Canada. The key to success is achieving a balance between environmental protection and the economic constraints that these may impose on the sector.

Appendix 2
Performance Measurement

The *Guide to Green Government* directs federal government departments to report annually on progress toward sustainable development. Consistent with this strategy's approach of integrating environment into the day-to-day business of the department, we will use existing reporting systems and mechanisms to report on departmental progress in its implementation. This poses an important challenge, especially in establishing linkages between departmental activities and external environmental outcomes, which are influenced by a variety of factors beyond the department's control.

Agriculture and Agri-Food Canada (AAFC) will measure performance by:

- assessing and reporting on its progress in implementing the action plans in *Strategy for Environmentally Sustainable Agriculture and Agri-food Development in Canada*;
- assessing and reporting periodically on sectoral progress on environmental sustainability.

For purposes of departmental assessment, a two-track approach will be followed. First, progress on implementation of individual action plan items will be recorded in detail. This information will then be clustered around the ten performance measures (PMs) identified in Table 1 below and selectively reported.

A range of potential measures at the levels of activity, output, and attributable impact was considered. ***Selected PMs will focus on realizing key outputs (environmentally related products and services) and on their impact (i.e., their contribution to environmentally sustainable agriculture).*** Measures of environmental outcomes were also considered. To assess these, the department has initiated work on agri-environmental indicators and has already provided some information through its 1995 report *The Health of Our Soils — Toward Sustainable Agriculture in Canada*. The agri-environmental indicators being developed by AAFC, which relate to primary production agriculture, are:

- **Farm Resource Management**: to track adoption by producers of environmentally sustainable farm management practices for land, soil, and farm inputs.
- **Soil Degradation Risk**: to track progress in reducing the vulnerability of agricultural soils to degradation processes such as wind and water erosion, salinisation, and organic matter loss.
- **Risk of Water Contamination**: to track progress in reducing the risk of water contamination by crop nutrients in agricultural areas.
- **Agroecosystem Greenhouse Gas Balance**: to track progress in controlling greenhouse gases emitted by agriculture.
- **Agroecosystem Biodiversity Change**: to track progress in conserving species and habitat diversity in agroecosystems.
- **Agricultural Efficiency and Productivity**: to track trends in agricultural productivity and efficient use of farm inputs.

Because of limited data, these indicators will be tracked on a five-year cycle (to coincide with the *Census of Agriculture*, a key data source) beginning in 1998–1999.

The agri-environmental indicators will provide important information that can be used by the department and others to establish and adjust policy and research priorities and to target efforts toward high-risk areas. Over the long term, these indicators might serve as excellent performance measures of the relative success of this strategy in affecting sectoral environmental progress. However, at this stage it is not possible to establish with confidence the contribution of the department through this strategy to sectoral progress as measured through these indicators. Many other influences, such as market forces, affect the adoption of environmentally sustainable practices, and the department does not have the means to precisely measure its impact on sectoral progress in this area.

To measure the department's success in implementing the strategy, each strategic direction will be monitored using the indices shown in the table below. Specific quantitative and qualitative measures of performance will be further developed and reported.

Strategic Direction	Performance Measures
Increasing Understanding	Nature and use by decision makers of AAFC environmental information products and methods.
	Environmental sustainability of AAFC policies, legislation, and programs.
Promoting Environmental and Resource Stewardship	Nature and results of efforts and mechanisms to conserve agricultural soil, water, biodiversity, and the atmosphere.
	Extent of implementing an Environmental Management System.
Developing Innovations and Solutions	Nature, scope, and adoption of environmentally sustainable systems and technologies.
	Nature and scope of information provided to clients on land and water resources and areas at risk.
Seizing Market Opportunities	Nature and scope of environmental marketing messages, methods, and strategies delivered to clients.
	Level of export readiness for environmental products and services.
	Nature of support provided to negotiations on trade and environment issues.
All Strategic Directions	Nature and scope of environmental partnerships established with clients.

Appendix 3
Consultations

Effective consultation with our industry and government partners is a key component of identifying the directions and goals of this strategy, and in carrying out the actions needed to achieve environmentally sustainable agriculture and agri-food production in Canada. In the spring of 1996, preparatory consultations on a preliminary set of strategic directions were held with the provinces and key sector organizations. Based on comments generated from these discussions, the documents were revised and circulated to stakeholders in July 1996, with an invitation for comments and suggestions for improvement.

Over the summer months, major revisions were made to the July documents and action items were added to the strategy. In October 1996, revised drafts were distributed to about 800 stakeholders with an interest in agri-environmental issues. Public consultation meetings were held across the country between 21 October and 27 November 1996. A national meeting was held in Ottawa, and two meetings, one with sectoral representatives and the other with provincial government officials, were scheduled in each of the provinces. During this six-week period, Agriculture and Agri-Food Canada consulted with more than 250 participants, including individual farmers, producer groups, food processors, conservation and environmental organizations, consumer associations, academic and research institutions, provincial governments, and other interested individuals. The documents were also made available on the Internet through AAFC's home page.

Dates and locations of consultation meetings and lists of individuals and provincial ministries who were invited to participate in the consultations are listed below.

Dates (1996) and locations of consultation meetings:

Abbotsford, B.C.	October 21
Edmonton, Alta.	October 22
Calgary, Alta.	October 23
Regina, Sask.	October 28
Saskatoon, Sask.	October 29
Winnipeg, Man.	October 30
Quebec City, Que.	November 4
Ottawa, Ont.	November 7
Guelph, Ont.	November 12–13
Fredericton, N.B.	November 18
Charlottetown, P.E.I.	November 19–20
Truro, N.S.	November 25
St. John's, Nfld.	November 26–27

The following individuals were sent the draft strategy and the companion document *Profile of Production Trends and Environmental Issues in Canada's Agriculture and Agri-food Sector* and were invited to participate in the consultation meetings:

BRITISH COLUMBIA

W. Andrews, West Coast Environmental Law Association
D. Arnold, Greater Vancouver Regional District
B. Bakker, British Columbia Horticultural Coalition
H. Barbolet, Farm Folk/City Folk Society
T. Beutel, The Delta Optimist
B. Bose, Surrey Municipality
B. Brink, British Columbia Federation of Naturalists
A. Brown, British Columbia Consumers' Association of Canada
S. Burton, Soil and Water Conservation Society

L. Campbell
R. Careless, British Columbia Space for Nature
A. Carr, International Wildlife Campaign
D. Chilvers, BC Hog Marketing Commission
G. Christie, Dairyworld Foods
M. Crowley, British Columbia Federation of Agriculture
G. Dunsworth, MacMillan Bloedel Ltd.
E. Fox, Consumers' Association of Canada, BC Branch
J. Fulton, The David Suzuki Foundation
M. Garland, University of British Columbia
F. Gilbert, University of Northern British Columbia
I. Gill, Ecotrust Canada
F. Gobas, Simon Fraser University
J. Grace, Island Natural Growers
B. Greenwell, Happy Hollow Nursery
L. Hadland
E. Hennan, Ducks Unlimited Canada
J. Holdstock, British Columbia Wildlife Federation
C. Iberg
J. Janzen, British Columbia Federation of Agriculture
W. Jeske, Corporation of Delta
D. Kenny, City of Surrey, Planning and Development Department
L. King, University of Northern British Columbia
L. Lavkulich, University of British Columbia
L. Leach, British Columbia Cattlemen's Association
D. Livingston, Agriculture Environmental Protection Council
S. Malmberg, Fort Steels Farm
L. Manchester, Canadian Earthcare Foundation
S. Martin, British Columbia Cattlemen's Association
P. Mason, BC Federation of Agriculture
D. McLean, Western Canada Fertilizer Association
C. Mumford, British Columbia Institute of Agrologists
J. Reams, Agriculture Institute of Canada
J. Reuter, Bio–Dynamic Agriculture Society of British Columbia
H. Reynolds
C. Rolfe, West Coast Environmental Law Association
J. Schmidt, Canada–British Columbia Green Plan Advisor
P. Schwirtz, Western Indian Lending Corporation
G. Scudder, University of British Columbia
A. Sleeman, British Columbia Environmental Network
S. Torrence, British Columbia Horticulture Coalition
T. Vicars
L. Walker, City of Surrey, Legislative Services Branch
B. Wylynko, Society Promoting Environmental Conservation

ALBERTA

B. Anderson, Alberta Association of Municipal Districts and Counties
D. Andrews, Canadian Cattlemen's Association
R. Axelson, Alberta Cattle Feeders' Association
M. Barr, Alberta Agriculture and Food Council
B. Brant, Western Canada Water and Wastewater Association
H. Bulten, Earthkeeping
G. Bussey, CAESA
J. Caby, Alberta Venison Council
S. Cairns, Pembina Institute for Appropriate Development
B. Calverley, Ducks Unlimited Canada
L. Campbell, University of Alberta
D. Foat, Western Stock Growers' Association
C. Foster, Alberta Barley Commission
K. Gibson, Alberta Food Processors' Association

H. Gordon, Prairie Association for Water Management
A. Graham, Alberta Wheat Pool
J. Graham, Alberta Conservation Tillage Society
S. Gunach, Canadian Environmental Network
D. Hall, Alberta Pork Producers' Development Corporation
R. Hazelwood, Council of Alberta Horticultural Industries
S. Hilton, Alberta Conservation Tillage Society
R. Houser, Alberta Fish and Game Association
D. Hufstra, Alberta Dairy Association
B. Jeffery, Alberta Canola Producers' Commission
G. Kerr, Woodlot Association of Alberta
R. King, Alberta Poultry Industry Council
J. and F. Kloberdanz, Prairie Association of Water Management
E. Kure, Agriculture Wildlife Habitat Canada
R. Leonhardt, Wild Rose Agricultural Producers
G. Lilge
B. Lipsey, Canada West Equipment Dealers' Association
J. Lore, Agriculture Institute of Canada
R. Mandryk
J. Martin, Friends of Environmental Education Society of Alberta
S. McIsaac, FEESA, An Environmental Education Society
P. Miller, Western Stock Growers' Association
F. Mueller
T. Murray, Farm Business Management Council
K. Olson, Earthkeeping — Food and Agriculture in Christian Perspective
J. Petruic, Alberta Pool
T. Rachuk, CIC Canola Industries Canada Inc.
S. Rempel, Diversity Conservation Group
B. Ross, University of Calgary
L. Ross, Canadian Bison Association
D. Rowledge, Alliance for Public Wildlife
C. Rypien
G. Sargent, Alberta Cattle Commission
E. Schultz, Alberta Pork Producers' Development Corporation
T. Sell, Toxics Watch Society
B. Staszenski, Environmental Resource Centre
F. Stewart, Canadian Llama Association
P. Strankman, Canadian Cattlemen's Association
R. Svanes
J. Taylor, Western Canada Pollution Control Association
R. Thierrin, Sustainable Agriculture Association
D. Tingley, Environmental Law Centre
H. Unruh, Alberta Irrigation Projects Association
M. Veeman, University of Alberta
H. Vredenburg, University of Calgary
B. Walker, Soil and Water Conservation Society of Alberta
C. Wallis, Alberta Wilderness Association
B. Walton, Canadian Council of Grocery Distributors
J. Waters, Growing Alberta
C. Westra
A. Wierenga, Alberta Conservation Tillage Society
M. Wright, Alberta Cattle Feeders' Association

SASKATCHEWAN

D. Acton, University of Saskatchewan
G. Alexander, Saskatchewan Livestock Association
D. Anderson, University of Saskatchewan
L. Anderson, Saskatchewan Alfalfa Seed Producers' Association
M. Anderson, Saskatchewan Stock Growers Association
R. Bailey, Saskatchewan Seed Growers' Association
E. Begin, Saskatchewan Wildlife Federation
M. Boehm, University of Saskatchewan
P. Brassard, Catholic Rural Life Ministry
B. Bracken-Warwick, Canadian Banker's Association
H. Buchanan, Saskatchewan Horticulture Association

B. Carles, Saskatchewan Wetland Conservation Corporation
B. Collins, Saskatchewan Water Corporation
E. Coxworth, Saskatchewan Environmental Society
L. Crosson, Saskatchewan Soil Conservation Association
G. Dauk
T. Dill, Ducks Unlimited Canada
J. Dosman, Royal University Hospital
C. Egert, Canadian Canola Growers' Association
P. England, Saskatchewan Institute of Agrologists
P. Flaten, Conservation Learning Centre
H. Furtan, University of Saskatchewan
E. Giesbrecht, Saskatchewan Fruit Growers' Association
R. Gray, University of Saskatchewan
O. Green, Saskatchewan Vegetable Growers' Association
C. Hale, Flax Growers of Western Canada
B. Halliday, Environment Canada
T. Hanson, Canadian Wheat Board, District 3
J. Harrison, Saskatchewan Environmental Society
B. Harvey, University of Saskatchewan
G. Hass, Soil Conservation Council of Canada
D. Hauer, Saskatchewan 4H Council
G. Hultgreen, Prairie Agricultural Machinery Institute
R. Hjeltc, Farm Credit Corporation Canada
D. Hockley, Saskatchewan Elk Breeders Association
G. Illerbrun, Saskatchewan Wildlife Federation
D. Jarrett, Saskatchewan Game Farmers Association
S. Johannesen, Saskatchewan Cattle Feeders Association
N. Johns, Saskatchewan Women's Agricultural Network
N. Ketilson, Saskatchewan Wheat Pool
L. Larsen, Saskatchewan Wheat Pool
V. Leland, Federated Cooperatives Limited
L. Maguire, Western Canadian Wheat Growers Association
K. Mannle, Saskatchewan Canola Growers
L. McGuire, Western Canadian Wheat Growers Association
D. McKell, Saskatchewan Soil Conservation Association
A. Mickleborough, University of Saskatchewan
P. Molder, University of Saskatchewan
L. Monseler, Saskatchewan Beekeepers Association
J. Morris, SPI Marketing Group
R. Olson, Saskatchewan Poultry Council
G. Patterson, Saskatchewan Pulse Crop Development Board
R. Paul, Saskatchewan Greenhouse Growers' Association
P. Penna, Canadian Environmental Network–Saskatchewan Ecological Network
I. Phillips, Saskatchewan Milk Producers
R. Piper, United Grain Growers
J. Quick, Saskatchewan Bison Association
D. Richards, Saskatchewan Water Corporation
K. Rosaasen, University of Saskatchewan
H. Rostad, University of Saskatchewan
S. Scarfe, Consumers Association of Canada
A. Scholz, Saskatchewan Food Processors Association
K. Semchuk, Royal University Hospital
G. Siemens, Saskatchewan Cattle Feeders Association
G. Silverthorn, Saskatchewan Forage Council
M. Smith, Saskatchewan Horse Federation
R. Smith, Saskatchewan Game Farmers Association
J. Stabler, University of Saskatchewan
M. Stauffer, Potash and Phosphate Institute
J. Stewart, University of Saskatchewan
A. Verrault, Saskatchewan Sheep Development Board
G. Willerth, Soil Conservation Council of Canada

MANITOBA

D. Adolphe, Canola Council of Canada
D. Alexander, Conservation Districts Association
M. Ballance, University of Manitoba

M. Beever, Manitoba Cattle Producers' Association
P. Brault, Cargill Limited
P. Braun, Manitoba Rural Adaptation Council
S. Briese, Union of Manitoba Municipalities
D. Broadfoot, Association for a Clean Rural Environment
R. Broeska, Canadian Oilseed Processors' Association
R. Bulley, University of Manitoba
D. Burton, Canadian Society of Soil Science
A. Calder, Corn Growers' Association Inc.
B. Clifford, Canadian Ostrich Association
B. Dalgarno, Manitoba Canola Growers' Association
T. Dooley, Manitoba Chamber of Commerce
J. Dubois, Riding Mountain National Park
J. Elliot, University of Manitoba
N. Fox, Pioneer Grain Corporation Limited
C. Friesen, Manitoba Chicken Producers' Board
G. Friesen, Manitoba Pork Establishment
H. Froese, Manitoba Egg Producers' Marketing Board
D. Giesbrecht, Manitoba Bison Association
G. Goodwin, Ducks Unlimited
T. Griffin, Vegetable Growers' Association of Manitoba
L. Hamblin, Manitoba Seed Growers' Association
K. Hawkins, Cargill Limited
B. Hicks, Prairie Fruit Growers' Association
B. Hoffman, Credit Union Central of Manitoba
B. Hood, Keystone Agricultural Producers
E. Hudson, Manitoba Elk Growers' Association
L. Jacobson, Keystone Agricultural Producers
T. Johnson, Manitoba Crop Insurance Corporation
H. Judauskas, Manitoba Naturalists' Society
D. Kraft, University of Manitoba
A. Lindsey, Canadian Environmental Network–Manitoba Ecological Network
J. MacMillan, University of Manitoba
L. MacNair, Canadian Federation of Agriculture, Western Women's Representative
O. McAuley, Manitoba Rural Adaptation Council
R. McLaren, Association of Irrigators of Manitoba
R. McLean, Soil and Water Conservation Society
G. McPhee, Keystone Agricultural Producers
O. Nelson, First Nations
B. Nielson, Consumers' Association of Canada
J. Nielson
J. Nikkel, Canada/Manitoba Farm Business Management Council
B. Oborne, Soil and Water Conservation Society
M. Peney, Western Fertilizer and Chemical Dealers' Association
L. Pizzey, Canada/Manitoba Agrifood Council
G. Racz, University of Manitoba
B. Rampton, Manitoba Pulse Growers' Association
S. Rampton, Manitoba–North Dakota Zero Tillage Farmers' Association
M. Rempee, Manitoba Rural Adaptation Council
D. Rolfe, Manitoba Pork
B. Routledge, Manitoba Crop Insurance Corporation
J. Ryrie, Canadian Association of Agri–Retailers
L. Sandercock, Canadian Association of Agri–Retailers
Y. Sheane, Organic Producers' Association of Manitoba
F. Siemens, The Winnipeg Commodity Exchange
C. Swanson, Manitoba Pool Elevators
F. Sylvester, Manitoba Food Processors' Association
A. Tyrchniewicz, International Institute for Sustainable Development
B. Uruski, Manitoba Turkey Marketing Board
C. Van Natto, Canadian Grain Commission
N. Van Ryssel, Manitoba Milk Producers

S. Van Walleghem, Agricultural Institute of Canada
J. Wasney, Consumer's Association of Canada
V. Watson, Canadian Grains Council
I. Wishart, Manitoba Forage Council Inc.
K. Yuill, Manitoba Sugar Beet Producers' Association Inc.
T. Zatylny, Canola Council of Canada

ONTARIO

B. Allison, AGCare
D. Armitage, Ontario Federation of Agriculture
J. Bacher, Preservation of Agricultural Land Society
S. Baumgartner, Canadian Wildlife Federation
D. Bennett, Canadian Labour Congress
G. Brinkman, University of Guelph
A. Brook, Carleton University
D. Brown, Brock University
P. Bubelis, Canadian Environmental Network
C. Carmody, Treasury Board Secretariat
S. Channer, Energy Probe Research Foundation
R. Cheel, Brock University
Q. Chiotti, Environmental Adaptation Research Group
G. Coffey, Toronto Environmental Alliance
K. Conn, Assembly of First Nations
M. Cooper, Ontario Farm Animal Council
G. Coukell, Ontario Farm Environmental Coalition
A. Crowder, Queen's University
H. Cummings, University of Guelph
G. Davison, Ontario Federation of Agriculture
T. Daynard, Ontario Corn Producers' Association
J. Deelstra, Christian Farmers' Federation of Ontario
F. Destrijker, Canadian Egg Marketing Agency
D. Dorey, Native Council of Canada
P. Doris, Ontario Cattlemen's Association
R. Down, Ontario Corn Producers' Association
L. Elliott, Thompson Gow and Associates
D. Evans, Trent University
T. Fenge, Canadian Arctic Resources Committee
G. Filyk, Wildlife Habitat Canada
J. Fisher, Ontario Soil & Crop Improvement Association
G. Fox, University of Guelph
D. Garvie, Queen's University
J. Gellert, Lakehead University
R. George, Agricultural Adaptation Council
T. Gillespie, University of Guelph
W. Gladwing, Ontario Deer Farmers' Association
M. Granskou, Canadian Parks and Wilderness Society
D. Harmsen, Queen's University
J. Hartwick, Queen's University
G. Hazlewood, Canada Mink Breeders' Association
P. Hodson, Queen's University
J. Hook, Canadian Wildlife Federation
R. Howe, Prairie Pools Inc.
M. Hummel, World Wildlife Fund Canada
T. Hutchinson, Trent University
K. Huttema, Canadian Broiler Hatching and Egg Marketing Agency
G. Jacob, Mining Association of Canada
G. Janes, National Council of Women of Canada, Preservation of Agricultural Lands Society
D. Jelinski, Queen's University
J. Johnstone, Canadian Organic Growers
B. Kay, University of Guelph
R. Kerr, Friends of the Earth
T. Kurtz, Soil and Water Conservation Society
W. Leask, Canadian Seed Trade Association
J. Leyds, Federation of Canadian Naturalists
D. MacKinnon, Agricultural Adaptation Council
J. Markus, Christian Farmers Federation of Ontario
W. Martin, Ontario Veterinary College

H. Martynse, Canadian Seed Growers' Association
D. McAllister, Canadian Centre for Biodiversity, Ocean Voice International, Canadian Museum of Nature
R. McFetridge, Canadian Museum of Nature
N. McGill
P. McGuinness, Fisheries Council of Canada
D. McKnight, Kemptville College
T. McQuail, Ecological Farmers Association of Ontario
J. McWilliam, Ontario Soil & Crop Improvement Association
C. Mercier, Canadian Feed Industry Association
T. Morris, Ontario Federation of Agriculture
S. Murphy, University of Waterloo
M. Nickerson, Guideposts for a Sustainable Futures Project
K. Nixon, Ontario Wheat Producers' Marketing Board
J. Patterson
G. Poechman, Ontario Organic Farmers' Co-op
W. Poley, Canchilla Associates Limited
M. Potter, Provincial Council of Women of Ontario
G. Prégent, Canadian Dairy Commission
D. Price-Jones, Rare Breeds Canada
E. Pringle, Soil and Water Conservation Society
P. Rae, Sim, Hughes, Ashton and McKay Barristers and Solicitors
C. Reimer, Inuit Circumpolar Conference
M. Ricker, The Richard Ivey Foundation
J. Robinson, University of Waterloo
W. Rose, Crop Protection Institute
H. Rudy, Ontario Soil and Crop Improvement Association
J. Sceicz, Queen's University
G. Shappert, Canadian Broiler, Hatching Egg Marketing Agency
Y. Sheppard, Canadian Society for Endangered Birds
J. Smith, Canadian Pork Council
S. Smith, Philip Utilities
D. Stanbridge, Professional Pest Consultants
G. Surgeoner, University of Guelph
T. Svensson, Ontario Federation of Agriculture
R. Todd, Consumers' Association of Canada
E. van Donkersgoed, Christian Farmers' Federation of Ontario
W. Veloche, Brock University
P. Verkley, Ontario Federation of Agriculture Environment Committee
T. Vyn, University of Guelph
B. Walpot, Ontario Federation of Agriculture
L. Walters, Clean Waters Coalition
B. Weaver, Ontario Federation of Agriculture
D. Woodard, Canadian Organic Growers' Association
T. Yonker, Great Lakes United
K. Zachariah, Jesuit Farm Project

QUEBEC

L. Barsalou, Fédération nationale des associations de consommateur du Québec
M. Beauchemin, Centre québécois du droit de l'environnement
A. Bélisle, Association québecoise de lutte contre la pollution atmosphérique
G. Blouin
D. Buszard, McGill University, Macdonald Campus
R. Charbonneau
D. Côté, Association des fabricants d'engrais du Québec
G. Debailleul, Université Laval
J. de Grandmart, Ordre des agronomes du Québec
N. Fortin, Coopérative Fédérée de Québec
C. Gauthier, Fédération québécoise de la faune
P. Gauvreau, Coopérative fédérée de Québec
P. Gosselin, Conseil d'administration d'EcoSommet
A. Gosselin, Université Laval
J. Henning, McGill University, Macdonald Campus
S. Hill, McGill University, Macdonald Campus
P. Jobin, Union québécoise pour la conservation de la nature, Centre d'Agrobiologie du Québec
S. Laliberté, Laliberté Cyanamid

A. Mackenzie, McGill University, Macdonald Campus
J. Martel, Canadian Pulp and Paper Association
R. Maurice, Association des machines aratoires du Québec
H. Mead, Union québécoise pour la conservation de la nature
G. Michaud, Comité de promotion de la féderation canadienne des producteurs
Y. Ouellet
G. Pelletier, Canadian Environmental Network–Reseau Québecois
P. Rasmussen, Réseau québecois des groupes écologistes
J. Simard, Union des municipalités régionales de comtés du Québec
S. Tessier, Université Laval
P. Thomassin, McGill University, MacDonald Campus
M. Turgeon, CREDDO
G. Vaillancourt, Union des Municipalités du Québec
M. Verschelden, Conseil régional de l'environnement du Saguenay

NEW BRUNSWICK

New Brunswick Cream Marketing Board
O. Allen, New Brunswick Farm Vacation Association
J. Arnold, Falls Brook Centre
H. Beaulieu, Fédération des agriculteurs et agricultrices francophones du Nouveau-Brunswick
M. Beckett, New Brunswick Jersey Club Breeders' Association
D. Bérubé, New Brunswick Sheep Breeders' Association
L. Bourgeois, Association des producteurs de fruits du Nouveau-Brunswick
E. Bourgeois, Régie de mise en marché des pommes du Nouveau-Brunswick
M. Brewer, Conservation Council of New Brunswick
B. Brown, New Brunswick Farm Women's Organization
P. Bunnett, New Brunswick Hog Marketing Board
C. Cameron, New Brunswick Rabbit Breeders' Association
A. Carlisle, New Brunswick Fruit Growers' Association
M. Coleman, Canadian Environmental Network, New Brunswick Environmental Network
D. Coon, Conservation Council of New Brunswick
G. Daley, New Brunswick Soil and Crop Improvement Association
N. DeLong, New Brunswick Cattle Marketing Agency
R. Doiron, Centre de formation agricole
J. Duar, New Brunswick Shorthorn Breeders' Association
N. Duivenvoorden, New Brunswick Branch of the Holstein Association
E. Estabrooks, New Brunswick Institute of Agrologists
J. Everett, New Brunswick Soil and Crop Improvement Association
C. Gamache, New Brunswick Dairy Goat Association
E. Gilbey, New Brunswick Beekeepers' Association
B. Hatt, New Brunswick Wild Blueberry Growers' Association
C. Hill, New Brunswick Seed Potato Growers' Association
D. Keenan, New Brunswick Potato Development and Marketing Council
B. Kilpatrick, Department of Agriculture
G. Kretzschmar, Agricultural Advisory Committee on the Environment
B. Lacey, New Brunswick Women's Institute
J. Laforge, Régie de la mise en marché du lait du Nouveau-Brunswick
L. Lapierre, Chaire d'étude en développement durable
P. LeBlanc, New Brunswick Greenhouse Products' Marketing Board
J. Losier, Fédération des agriculteurs et agricultrices francophones du Nouveau-Brunswick
P. MacDonald, New Brunswick Potato Agency
R. MacLean, Horticultural Producers' of Southern New Brunswick

B. MacLeod, New Brunswick Simmental Breeders' Association
B. MacMinn, New Brunswick Branch of the Holstein Association
G. Maicher, New Brunswick Institute of Agrologists
L. Martin, New Brunswick Chicken Marketing Board
D. McLaughlin, University of New Brunswick
C. McLean, New Brunswick Institute of Agrologists
R. McLellan, New Brunswick Maple Producers Co-Operative Ltd.
A. Méthé, Fédération des agriculteurs et agricultrices francophones du Nouveau-Brunswick
A. Michaud, Fédération des agriculteurs et agricultrices — Nord-Ouest
S. Mitham, New Brunswick Guernsey Breeders' Association
C. Morris, New Brunswick Aberdeen Angus Association
D. Munn, New Brunswick Rabbit Breeders' Association
P. Normand, New Brunswick Flue Cured Tobacco Marketing Board
B. O'Neill, New Brunswick Soil and Crop Improvement Association
B. Oliver, Agriculture Advisory Committee on the Environment
W. Omvlee, New Brunswick Agricultural Environmental Council
S. Othberg, New Brunswick Limousin Breeders' Association
L. Ouellette, Centre de conservation des sols et de l'eau de l'est du Canada
L. Wayne Patterson, Council for Sustainable Community Development
G. Pelletier, McCain Foods
C. Saulnier, Comité consultatif agricole sur l'environnement
J. Schenkels, Atlantic Farmers Council
M. Simpson, Sustainable Community Development
P. Soucy
R. Steeves, New Brunswick Fur Farmers' Association
K. Sullivan, National Farmers Union
R. Thériault, New Brunswick Grain Growers' Association
B. Thompson, New Brunswick Turkey Marketing Board
S. Thompson, University of New Brunswick
I. Thorleifson, New Brunswick Deer and Elk Farmers' Association
T. Toner, New Brunswick Potato Shippers' Association
B. Trenholm, New Brunswick Sheep Breeders' Co-op Ltd.
S. Tyler, Organic Crop Improvement Association — New Brunswick
D. Walker, New Brunswick Grain Commission
F. Waterston, New Brunswick Ayrshire Breeders' Association
V. Wilson, New Brunswick Hereford Association
G. Windsor, New Brunswick Farm Market Association
G. Wingate, Organic Crop Improvement Association.
G. Wood, Wild Blueberry Association of North America

NOVA SCOTIA

J. Arbour, Soil and Water Conservation Society
T. Burnside, Nova Scotia Agricultural College
B. Casson, Strawberry Growers' Association of Nova Scotia
P. Clark, Chicken Producers Association of Nova Scotia
D. Cox
R. Donald, Jacques Whitford Consultant
G. Ernst, Freedom to Farm
P. Jacobs, Peter Jacobs and Associates Ltd.
C. Keddy, Nova Scotia Federation of Agriculture
K. Laine, Nova Scotia Environment and Development Group
L. Lusby, Acadia University
B. McCurdy, Bidalosy Farms Ltd.
R. Nash, Wild Blueberry Producers Association of Nova Scotia
B. Robinson, Landmark Resource Consultants Ltd.
P. Stokdijk

G. van Dyk, Pork Council of Nova Scotia
Vegetable and Potato Producers Association of Nova Scotia
P. Warman, Nova Scotia Agricultural College

PRINCE EDWARD ISLAND

Island Nature Trust
R. Affleck, National Farmers' Union
J. Arsenault, Prince Edward Island Round Table on Resource Land Use and Stewardship
A. Boswall, Prince Edward Island Federation of Agriculture
D. Boyce, Southeast Environmental Association
P. Burgoyne, Environmental Coalition of Prince Edward Island
M. Ching, Black Pond Farms Ltd.
R. Coffin, Cavendish Farms
O. Dawydiak, Prince Edward Island Sheep Breeders' Association
K. Deelstra, Prince Edward Island Institute of Agrologists
L. Dennis, Prince Edward Island Federation of Agriculture
B. Dingwell, Prince Edward Island Milk Marketing Board
E. Dixon, Prince Edward Island Cattlemen's Association
K. Good, Prince Edward Island Horticultural Association
D. Harker, Organic Crop Improvement Association (Prince Edward Island)
W. Hicken, Prince Edward Island Egg Commodity Marketing Board
E. Jewell, Potato Producers Association of Prince Edward Island
S. Labchuk, Environmental Coalition of Prince Edward Island
C. MacAulay, Prince Edward Island Soil and Crop Improvement Association
P. MacAulay, Potato Producers Association of Prince Edward Island
B. MacPherson, Cavendish Farms
C. McDonald, Prince Edward Island Federation of Agriculture
C. Mermuys
L. Murray, Prince Edward Island Hog Marketing Board
B. Penak, Bedeque Bay Environmental Management Association
D. Read, Prince Edward Island Vegetable Growers' Coop. Association Ltd.
S. Stephenson, Canadian Environmental Network — Prince Edward Island
S. Stewart, Executive Council
L. Thompson
K. Visser
M. Wood, Prince Edward Island Potato Board
R. Yeo, Prince Edward Island Horticultural Association

NEWFOUNDLAND

D. Baird, Consumer Association of Canada–Newfoundland Chapter
E. Calloway, Newfoundland and Labrador Farm Women's Network
D. Collins, Newfoundland Dairy Processors' Association
Z. Cullihall, Provincial Farm Womens' Association
F. Dormody, Newfoundland Chicken Marketing Board
W. Fiander, East-Chem Inc.
M. Hammond, Newfoundland Milk Marketing Board
R. Lee, Memorial University of Newfoundland
J. Lester, Newfoundland and Labrador Vegetable Producers' Association Inc.
L. March, Canadian Environmental Network–Newfoundland and Labrador
R. Noseworthy, Newfoundland Egg Marketing Board
C. O'Toole, Atlantic Environmental Farm Plan Initiative
H. Pippy, Newfoundland and Labrador Federation of Agriculture
K. Proudfood, Newfoundland Horticultural Society
B. Simmons, Newfoundland and Labrador Federation of Agriculture
C. Smallwood, Canadian Envionmental Network–Newfoundland and Labrador

H. Taylor, National Farmer's Union
S. Todd, Newfoundland and Labrador Institute of Agrologists
E. Woodrow, Newfoundland and Labrador Institute of Agrologists

NATIONAL

C. Abbatemarco, National Meat Council
T. Andrew, National Agriculture Environment Committee & Canadian Cattlemen's Association
J. Bruce, Soil Conservation Canada
N. Burnell, National Agriculture Environment Committee & Federated Women's Institute of Canada & Farm Women's Network
J. Burrows, National Agriculture Environment Committee & Nova Scotia Federation of Agriculture
R. Carver, Agriculture Institute of Canada
P. Chilton, Pollution Probe Foundation
J. Chiperzak, Rare Breeds Conservancy
J. Clair, Canadian Wheat Board
D. Coburn, National Agriculture Environment Committee & New Brunswick Federation of Agriculture
K. Cox, North American Wetlands Conservation Council
K. Crawford, Canadian Turkey Marketing Agency
B. Cudmore, National Agriculture Environment Committee & Prince Edward Island Federation of Agriculture
L. Curry, Grocery Products Manufacturers of Canada
K. Edie, National Agriculture Environment Committee & Prairie Pools Inc.
K. Einerson, Canadian Fertilizer Institute
J. Eisenhauer, Nature Conservancy of Canada
H. Esquirol, Western Canadian Wheat Growers Association
J. Flint, Industrial Biotechnology Association of Canada
S. Forsyth, National Agriculture Environment Committee
J. Fortune, Wildlife Habitat Canada
R. Friesen, Canadian Turkey Marketing Association
M. Garr, National Agriculture Environment Committee & Ontario Federation of Agriculture
J. Geci, Canadian Council of Grocery Distributors
J. Gelfand, Canadian Nature Federation
P. Girouard, REAP–Canada
A. Hackman, World Wildlife Fund Canada
H. Haidn, National Agriculture Environment Committee & National Farmers Union
M. Haley, National Agriculture Environment Committee & Canadian Cattlemen's Association
G. Hamblin, National Agriculture Environment Committee & Canadian Organic Advisory Board
H. Hamilton, The Canadian Biodiversity Institute
E. Heaney, National Agriculture Environment Committee
C. Huemer, Canadian Coalition for Biodiversity
K. Jardine, Greenpeace, National Office
D. Knott, National Round Table on Environment and Economy
A. Kothawala, Canadian Restaurant and Food Services Association
C. Kyte, Food Institute of Canada
A. Lang-Harris, National Agriculture Environment Committee & Dairy Farmers of Canada
E. Legge, National Agriculture Environment Committee & Newfoundland and Labrador Federation of Agriculture
K. Matte, National Dairy Council
C. Maxwell, Canadian Wildlife Federation
E. May, Sierra Club (Canada)
E. McDonald, Canadian Horticulture Council
L. Ménard, National Agriculture Environment Committee & Union des producteurs agricoles
D. Middleton, Canadian Farm Business Management Council
A. Mitchell, Canadian Institute for Environmental Law and Policy
D. Morgan, National Round Table
R. Morrisson, Brewer's Association of Canada

P. Muldoon, Canadian Environmental Law Association
A. Mutch, Canadian Grains Council
D. Neave, Wildlife Habitat Canada
K. Newkirk, Canadian Wildlife Federation
V. Nishi, Resource Futures International
J. Patterson, Ducks Unlimited Canada
R. Perrault, Industrial Biotechnology Association of Canada
A. Ransom, National Agriculture Environment Committee & Keystone Agricultural Producers
C. Rivard, Dairy Farmers of Canada
H. Rowley, Canadian National Millers Association
S. Rutherford, Canadian Federation of Agriculture
C. Saint-Laurent, World Wildlife Fund of Canada
T. Sawyer, Soil Conservation Council of Canada
M. Scammell, Rare Breeds Canada
E. Schacherl, Canadian Environmental Network
J. Scott, Canadian Federation of Independent Grocers
J. Shaw, CIBA–Crop Protection Institute of Canada
L. Simpson, Nature Conservancy of Canada
S. Singh, Canadian Turkey Marketing Agency
N. Storch, National Agriculture Environment Committee & Canada/Alberta Environmentally Sustainable Agriculture Agreement
J. Thompson, National Agriculture Environment Committee & British Columbia Federation of Agriculture
J. van Vulpen, National Agriculture Environment Committee & Canadian Pork Council
P. Vanderpol, Canadian Poultry and Egg Processors Council
R. Walter, Canadian Institute of Biotechnology
R. Weaver, Canadian Meat Council
R. Weisenburger, Agricultural Institute of Canada
J. Wilkinson, National Agriculture Environment Committee & Canadian Federation of Agriculture
J. Wilson, National Agriculture Environment Committee & Canadian Horticulture Council
M. Zingle, National Agriculture Environment Committee & Canadian Forage Council

The following provincial ministries were invited to review the documents and participate in the consultation meetings:

British Columbia Ministry of Agriculture, Fisheries and Food
British Columbia Ministry of Environment
Alberta Ministry of Agriculture, Food and Rural Development
Alberta Ministry of Environmental Protection
Alberta Agricultural Research Institute
Saskatchewan Agriculture and Food
Saskatchewan Environment and Resource Management
Saskatchewan Water Corporation
Manitoba Agriculture
Manitoba Environment
Manitoba Natural Resources (Manitoba Habitat Heritage Corporation)
Ontario Ministry of Agriculture, Food and Rural Affairs
Ontario Ministry of Environment and Energy
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
New Brunswick Department of Agriculture and Rural Development
New Brunswick Department of Environment
Prince Edward Island Department of Agriculture, Fisheries & Forestry
Prince Edward Island Department of Environmental Resources
Nova Scotia Department of Agriculture and Marketing
Nova Scotia Department of the Environment
Government of Newfoundland and Labrador, Department of Forest Resources and Agrifoods